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Factors Impacting University-Level Language Teachers' Technology Use and Integration

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by

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TABLE OF CONTENTS

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ABSTRACT

Despite the documented affordances of technology to enhance language teaching and learning, technology use does not seem to be normalized just yet. This dissertation investigates the factors that impact university-level language teachers' technology use and integration. Adopting the ecological perspective as a guiding framework, this study particularly examines teacher-level factors, ecosystem-level factors, and teacher-ecosystem interaction and how this interaction impacts overall technology use in language teaching. A single case-study methodology with three embedded units of analysis was employed to answer the research questions. Data sources included semi-structured interviews, classroom observations, field observations, and course management system records. Eight language teachers, three administrators, and three technical and pedagogical support personnel personnel participated in the study. The results indicated that teacher-level factors included teachers' *beliefs about the role of technology*, *daily technology use*, *technical skills*, *training in technology*, and *professional/research interests*. The ecosystem-level factors consisted of *access to technology*, *funding opportunities*, *administrative support*, and *professional development*. Finally, the factors that impacted university-level language teachers' technology use and integration grown out of teachers' interaction with the ecosystem entailed *student characteristics, peer interaction, technical and pedagogical support personnel*, and *inter-departmental collaboration*. The results of this study showed that the ecological perspective could provide a

holistic lens to examine language teachers' decisions and practices of technology use and integration. This dissertation has practical implications for language programs and language teacher preparation programs, as well as theoretical implications for the use of ecological perspective in understanding language teachers' technology use or non-use.

CHAPTER 1: INTRODUCTION

Developments in computer and communication technologies over the last decade have provided exciting opportunities for language teaching and learning. Today, language learners have the ability to interact instantaneously with native speakers or other language learners and they can access a large variety of target language resources and a variety of input. Similar to the technological advancements, universities hoping to transform education have invested large amounts of money into the systematic development of technological infrastructures that equip their campuses with top-notch technology (Garrison & Kanuka, 2004; Georgina & Olson, 2008). The exponential growth in the number of opportunities provided by faster computers and Internet connections have forced universities and colleges to invest in technologies that have opened up new instructional possibilities in classrooms.

Despite the gradual growth in the use of digital technologies by language teachers over the last fifteen years, integration of technology into language classroom pedagogy still seems to be fairly limited (Guichon & Hauck, 2011) and *normalization*–the stage wherein technology is so embedded in a teacher's everyday practices that it is almost invisible–does not seem to have yet occurred (Bax, 2003). Salaberry (2001) goes so far as to argue:

> whereas most "new technologies" (radio, television, VCR, computers) may have been revolutionary in the overall context of human interaction, it is not clear that they have achieved equal degrees of pedagogical benefit in the realm of second language teaching (p. 39 emphasis in the original).

Furthermore, a 1998 state survey conducted in Texas with 400 foreign language teachers indicated that the majority of the participants made very little use of computers and the Internet to teach the target language and culture (Moore, Morales, & Carel, 1998). Eleven years later, another study conducted in Spain found that although teachers' use of and familiarity with information and communication technologies for personal and professional purposes has indeed increased, this use had not yet been bridged to teaching practices (Dooly, 2009). This raises the question: what hinders and/or encourages language teachers to pursue a technology-enhanced pedagogy that will equip their students with the necessary skill set to function in the target language they are learning?

Background

Previous research has shown that several factors, both external and internal, impact language teachers' technology integration such as: (a) lack of time, (b) availability of resources, (c) institutional support, (d) peer support, (e) technology teacher training, (f) professional development, (g) student characteristics, (h) technical skills and daily computer use and (i) pedagogical beliefs (Chambers & Bax, 2006; Y. L. Chen, 2008a, 2008b; England, 2007; Kessler, 2007, 2006; Lam, 2000; Lu, 2006; Shin & Son, 2007; Winke & Goertler, 2008; Yunus, 2007). Although these factors are discussed in more detail in chapter 2, an overview will be provided here to briefly present what has been found to be impacting language teachers' technology use, or lack thereof, in the classroom.

As stated above, t*ime,* or more specifically, lack of time, is cited as a major barrier for technology use in language instruction by teachers mainly for three reasons: (1) lack of time in and out of the classroom; (2) lack of time to identify and/or create resources and teaching materials; and (3) lack of time to learn or practice new technologies. Language teachers feel pressured during a given class period to cover a large amount of content, and technology-integrated activities typically take more time to implement because of issues such as technical glitches and an unfamiliarity with the software and/or tools (Egbert, Paulus, & Nakamichi, 2002). Moreover, extra time required to locate or create materials for technology-enhanced activities was deemed an obstacle for technology integration efforts; it is too time-consuming to locate and/or create quality learning materials (Lam, 2000). Finally, teachers lacked the time required to learn how to use new technologies and/or software, and since language teachers needed repetitive learning to improve their familiarity and comfort with different technologies, their lack of time to do so hindered the adoption or integration of technology-enhanced pedagogies (Kessler & Plakans, 2008).

Availability, or more pointedly, *lack of resources,* has also been considered a very important factor that impacts technology integration efforts in language education. While the availability of and accessibility to computers and sufficient financial support were found to directly impact successful technology integration and sustainability of any pedagogical innovation (Inan & Lowther, 2010a), limited access to technologies has impacted the process of technology integration for language teachers; hence the lack of

access to computers has been one of the most prominent barriers (Egbert et al., 2002; England, 2007; Shin & Son, 2007; Yunus, 2007).

Administrative and technical support has often been regarded as critical components of the sustainability of technology integration efforts (Anderson & Dexter, 2000; Owston, 2007). While administrators play a key role in implementing technology-enhanced pedagogies by providing physical and psychological support to teachers, an additional person, specifically for technology support, ensures that teachers will keep up with the ever-changing nature of computer technology and their technical issues will be addressed in a timely manner. The presence of such technical support was found to be as a critical factor for teachers in developing their confidence and comfort levels using CALL activities in teaching languages (Kessler & Plakans, 2008), while the lack of such technology support was found to hinder or even stop language teachers' technology integration efforts altogether (Y. L. Chen, 2008b).

Research commonly suggests that teachers usually learn about different types of technologies that can be used for instruction not through formal learning environments (i.e. teacher education, professional development activities), but rather through informal means of learning (Kessler, 2006). One effective, informal way of learning occurs through *peer interaction,* whereby teachers discuss successes and failures and learn from one another (Boyd, 1992). As opposed to one-shot, de-contextualized workshops, learning in a community of practice ensures ongoing, on-site, and just-in-time support where teachers share ideas and can model best practices (Glazer, Hannafin, & Song, 2005). In this aspect, language teachers are no different than other

teachers, in that they also listed their colleagues as the main source of information for different kinds of technology activities (Egbert et al., 2002). Furthermore, their comfort level with technology was impacted by other teachers (Kessler & Plakans, 2008), and they stated that they learned better when they interacted and collaborated with their peers, but this interaction was rather limited (Y. L. Chen, 2008b).

Currently, *language teachers' preparation in technology* includes such approaches as reading a chapter in a methodology course, participating in in-service workshops, taking a stand-alone CALL course, or taking CALL course series, obtaining CALL certificates and earning a graduate degree in CALL (Hubbard & Levy, 2006). In this regard, the most widespread training seems to be acquired informally through in-service workshops, conferences, personal reading and other forms of self-edification, indicating that formal language teacher preparation programs have tended to ignore the emerging need to prepare language teachers for a technology-laden society and technologically advanced language classrooms (Kessler, 2006). Studies examining the influence of stand-alone CALL courses on actual classroom usage concluded that personal exigency, rather than coursework, was a better predictor of teachers' technology implementation (Egbert et al., 2002; Kessler, 2007). Chen (2008b) argued that training teachers in technology was important in helping language teachers use the Internet in their classrooms since it was much easier for language teachers with a technology-related degree to locate resources and know how to use those resources, as compared to other EFL (English as a Foreign Language) teachers with no technology background.

Professional development opportunities have also been found to affect teachers' technology implementation, and lack of computer training possibilities was cited as a challenge to using technology for instructional purposes in language classrooms (Yunus, 2007). Prior research confirms that language teachers who participate in professional development activities related to technology integration feel more comfortable developing Internet-based materials for their classrooms. However, workshops focusing on technological skills were found to be ineffective since those workshops usually disregarded the pedagogical reasoning behind the technology integration (Y. L. Chen, 2008a, 2008b).

Student characteristics such as technical skills, cognitive abilities, and access to technology outside the classroom also impact language teachers' decisions about how they use technology for language instruction and whether or not to pursue implementing technology-enhanced activities. For example, Winke and Goertler (2008) found that although the majority of students owned personal computers, fewer of them had access to microphones and webcams, which were extensively used in CALL activities. In addition, students failed to transfer their daily use of certain technologies to their instructional contexts, which led the authors to argue, "poor access and/or literacy in using such tools will make practice difficult or anxiety laden" (p. 493).

Another challenge in technology implementation for language instruction has been the various levels of teachers' *technical skills* (Albirini, 2006; Lu, 2006; Shin & Son, 2007; Yunus, 2007). Teachers who were not confident in their technical skills were usually afraid of losing control of the classroom and were not eager to take risks. Being

equipped with the required technical skills, on the other hand, positively impacted language teachers' technology integration, as they were better able to address other barriers (Kennedy & Levy, 2009). Kennedy and Levy (2009) shared that teachers' technical and pedagogical skills contributed to the success of CALL integration in teaching Italian, as they felt confident in designing and managing their projects on their own. These teachers were able to address both technical and pedagogical issues themselves without needing any technical support, which expedited their integration process.

Finally, prior research cites *pedagogical beliefs* as one of the critical factors of successful technology integration. In other words, the more strongly teachers believed that computers were compatible with their particular teaching styles, the more often they reported using them for organizing their teaching materials in innovative ways (Zhao & Frank, 2003). In particular, teachers who held a constructivist language teaching philosophy were more inclined to use technology for higher cognitive level tasks (Y. L. Chen, 2008b; Van Braak, 2001).

Previous research has clearly resulted in a long list of factors that may influence language teachers' decisions and practices with technology integration into language instruction. However, these factors were identified either by examining the impact of an individual factor (e.g. technical skills) on technology use, or by compiling a list of factors through surveys, and the validity and reliability scores of most of these surveys have not been reported. Also, previous literature on barriers does not provide a clear pathway for addressing issues in language teachers' technology use and integration. Where should

one start if s/he wants to eliminate these barriers? Should they be addressed one by one from the list? Or might resolving one issue influence another? The isolated focus on discrete factors has disregarded the messy and complex interaction among different variables that might be in constant interaction with each other in affecting overall technology use. This study aims to fill this gap by adopting a unifying theoretical framework and focusing on language teachers and the contextual factors that might influence and explain what they do in their classrooms with technology.

Theoretical Framework

Very few, if any, studies on the factors impacting language teachers' technology use and integration seem to adopt a well-established theoretical framework to guide the analysis process. To fill this gap and present a more robust picture of the factors impacting language teachers' technology use, this study adopts an *ecological perspective* as the theoretical framework. The ecological perspective, which will be explained in greater detail in chapter 2, was initially applied to technology integration by Zhao and Frank (2003) and later improved by Davis (2008; in press) to analyze the factors impacting teachers' technology integration from a holistic lens and identify the teacher and ecosystem-level factors impacting university-level language teachers' decisions and practices of technology use. It was built upon the principles of the science of ecology and the concept of *ecosystem*, in particular. From the ecological perspective, each classroom is considered to be an *ecosystem* on its own, nested within the ecosystem of a department, and each department is nested within the ecosystem of the school, which is nested within the local area, the region and the global biosphere of

education (Davis, in press; Zhao & Frank, 2003). Multiple factors at these different layers of the global biosphere of education impact teachers' decisions and practices of technology use. However, this impact is not equally distributed in different levels in a linear fashion. Rather, they were mediated by what teachers believe the role of technology is in teaching and learning (Zhao & Frank, 2003). Therefore, the framework provides a baseline for examining the multi-faceted factors that are in constant interaction with each other and how they influence teachers' classroom practice with technology.

Statement of the Problem

Despite the affordances provided by enhancements in computer and Internet technology and the ongoing efforts to provide teachers with different technologies that can be used to enhance instruction, the integration of technology into language education seems to be limited (Bax, 2003; Guichon & Hauck, 2011). Therefore, underlying factors that might be impacting language teachers' decisions and practices need to be investigated further. Although there is a significant amount of literature on the barriers to technology integration, research on factors enabling teachers to overcome those barriers is more limited (Ertmer, Ottenbreit-Leftwich, & York, 2007). Focusing on "factors" will ensure both barriers to technology integration and factors that contribute to successful technology integration are addressed.

Although research specifically in educational technology could also shed some light on the field of second or foreign language teaching, the practice of language teaching is quite different than other subject areas with different demands and

requirements (Zhao, 2003). Hubbard (2008) even goes so far as to caution against relying on generic educational criteria by arguing that the field of language learning is "recognized as a unique field that should be wary of relying too much on generic educational criteria" (p. 3). Therefore, more research examining factors that directly impact language teachers' technology use is needed. Is simply bringing new technology into classrooms enough to transform teaching? Investigating a university-level setting equipped with up-to-date software and hardware might better explain if there are any other factors impacting language teachers' decisions and practices of technology use and integration.

Purpose of the Study

The ultimate goal of this study is to uncover the factors impacting university-level language teachers' technology use or non-use. For the purposes of this study, no distinction was made between second language teachers and foreign language teachers; rather, second language (L2) teaching was taken as the major topic of concern. In addition, technology use, interchangeably referred to as *technology integration*, was defined as any use of computer technology for the purposes of language learning and teaching (Warschauer & Healey, 1998). Based on the principles of the ecological perspective using the recommendations of Zhao and Frank (2003) and Davis (2008; in press) this study aims to identify factors impacting university-level language teachers' technology use and integration. More specifically, this research seeks to accomplish three goals. The first goal is to identify teacher-level factors impacting university-level language teachers' decisions and practices of technology use. The second goal is to

discover ecosystem-level factors impacting university-level language teachers' technology use and integration. Finally, how teacher-ecosystem interaction impacts university-level language teachers' technology use and integration will be analyzed.

Research Questions

The main goal of this study is to answer the general question, "What are the factors impacting university-level language teachers' technology use versus non-use?" Specifically, the following research questions will be addressed in this dissertation study:

1. What are the teacher-level factors impacting university-level language teachers' technology use or non-use?
2. What are the ecosystem-level factors that impact university-level language teachers' technology use or non-use?
3. How does teacher-ecosystem interaction impact university-level language teachers' technology use or non-use?

Significance of the Study

Findings from this dissertation study will contribute to the knowledge base in teacher education, educational technology, and Computer Assisted Language Learning (CALL). First, this study adopts a unifying theoretical framework to analyze the factors impacting language teachers' decisions and practices of technology, which few barrier studies have done thus far. In addition, this study provides a systemic analysis of technology integration, as opposed to the common focus on the implementation of a single application in CALL research (Zhao, 2003). This dissertation provides practical implications for language teaching programs and language teacher education programs

by identifying the areas in need of improvement to successfully integrate technology into language instruction. Since there is an ongoing trend to equip university campuses with technology, it is important to know what factors might play a role in teachers' technology use (i.e. other than the availability of resources) so that precautions can be taken to ensure successful technology integration. Hence, this study is a valuable contribution to the knowledge of application of technology use and integration efforts.

Organization of the Dissertation

This dissertation consists of five chapters. The first chapter introduces the study by briefly discussing the current status of technology use in language instruction and the factors identified in the literature that were found to be impacting language teachers' decisions and practices in technology use. Next, the theoretical framework, problem statement, the purpose, the research questions, and significance of the study are presented in chapter 1. Then chapter 2 introduces the theoretical background and reviews the literature on factors and barriers impacting teachers' technology integration efforts in greater detail. Chapter 3 introduces the single-case study research methodology and describes the research context, participants, and data collection techniques and materials followed by research procedures and steps taken in the data analysis. Chapter 4 presents and discusses the results in order of the research questions. Chapter 5 summarizes the results and brings into discussion of the findings, limitations, and implications; the chapter ends with directions for future research and general conclusions.

Definition of Terms

Barriers: Factors that are found to be impeding teachers' technology use.

CALL technology: This refers to computers, computer hardware, software applications, multimedia, courseware, course management systems and any other related digital technologies used in language learning and teaching.

Exemplary technology-using teachers: Language teachers who were nominated as "exemplary" by their departmental leaders because of their high level of technology use for instructional purposes.

Information and Communication Technology (ICT): is the study of technology used to handle information and aid communication. The phrase was coined by Denis Stevenson in his 1997 report to the UK government and promoted by new National Curriculum documents for the UK in 2000. (FOLDOC, 2012)

Limited technology-using teachers: Language teachers who were nominated by their departmental leaders for their low or moderate level of technology use for instructional purposes.

Language teachers: Teachers who teach a language that is not the native language of learners, regardless of whether they learn it in a foreign or second language context (e.g. ESL (English as a Second Language), EFL (English as a Foreign Language), and other foreign languages such as Spanish, Portuguese, and French)

Technology: This refers to computers, computer hardware, software applications, multimedia, courseware, course management systems and any other related digital technologies used for personal or professional purposes.

Technology integration: (interchangeably referred as technology use) refers to any use of computer technology for the purposes of learning and teaching.

Chapter 2: LITERATURE REVIEW

This chapter reviews literature that both influenced this dissertation and provided a starting point for analyzing university-level language teachers' technology use and integration. First, it describes the ecological perspective (Zhao, 2003; Davis, 2008; in press) to examine classroom technology use and makes a case for how it is appropriate to guide the data analysis in this dissertation. Then it presents a thorough review of the studies in educational technology and CALL that examined the factors impacting teachers' decisions on technology use and integration.

Theoretical Framework

The ecological perspective, which is framed around the basic notions of ecology and *ecosystems* in particular, is used as the theoretical framework for this dissertation study. The ecological perspective was initially applied to technology integration by Zhao and Frank (2003) and later revised by Davis (2008; in press) to understand the factors impacting K-12 teachers' technology use and integration. Following is a presentation of these two complementing perspectives and how they can be used to investigate university-level language teachers' technology use and integration.

Zhao and Frank's Ecological Perspective

The application of the ecological perspective in understanding the diffusion process of technology within educational systems requires establishing the metaphorical equivalents. Considering this, Zhao and Frank (2003) argue that schools are *ecosystems*, teachers are members of a *keystone species,* and computer uses are

living species. Following is an explanation of what Zhao and Frank call "metaphorical bridges" in understanding the technology integration process. (p. 811).

As seen in Figure 1, a school and its classrooms are considered to be an *ecosystem,* as the lowest-level component of the ecological hierarchy, nested within a multi-layered hierarchy including government agencies, societal institutions, local community organizations and the school bureaucracy. The outermost layer, as the arrows indicate, implies the influence of societal and governmental institutions have relative influences on teachers' classroom practices and technology use. In the last

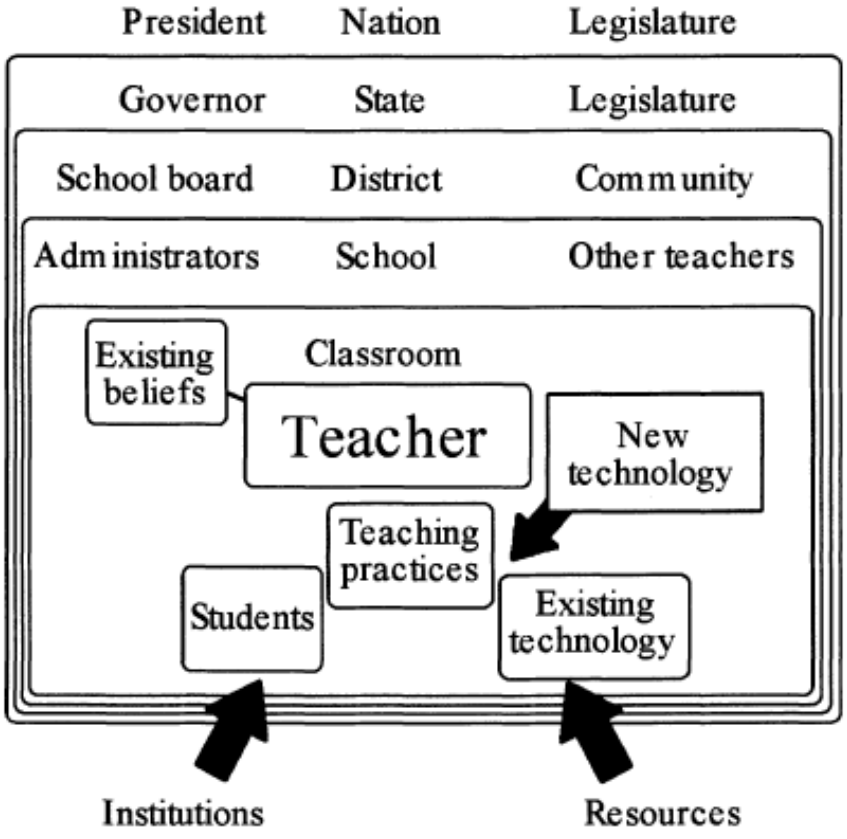

Figure 1. The school ecosystem (Zhao & Frank, 2003; p. 815)

decade there has been a strong institutional demand at both the governmental and societal levels to place computers in classrooms and provide teachers and students with laptops (Bianchi, 2004; Gray, Thomas, & Lewis, 2010a; Holcomb, 2009; Miller, 2011). Although these societal and governmental institutions are distanced from individual classrooms, they at times have a relatively strong impact on how and to what degree teachers use technology. The school district, which is closer to the immediate context of teachers, is more likely to influence teachers' practices with technology. If the district's technology integration philosophy is compatible with its teachers' philosophies, then technology use tends to diffuse faster, on the grounds that sufficient resources are provided.

As an ecosystem, a given school and its classrooms are considered to be a complex system with its *biotic* and *abiotic* components engaging in diverse relationships. In a school ecosystem, biotic components refer to living organisms or species such as teachers, students, parents and administrators. Abotic components, on the other hand, refer to non-living factors affecting the school ecosystem, such as physical setting, location of the computers, grades and subjects taught. All of these different species each have a set of characteristics and each plays its own unique role (i.e. *niche*) in reaching the overarching goal of facilitating learning. These characteristics and roles influence one another and continually alter their intra- and inter-relationships. Therefore, both biotic and abiotic components play a major role in what teachers do in their classrooms and what role technology plays in their teaching. For example, where computers are located in a school, classrooms versus a shared computer lab, might

influence teachers' decisions and practices of integrating technology into their instruction; certain content areas might lend themselves to technology integration better than other content areas, to name a few.

Within an ecosystem, some species are critical for maintaining the structural and organizational hierarchy in an ecological community. These are called *keystone species* and they have disproportionately large effects on the ecosystem regardless of their population size. In a school ecosystem then, teachers may be regarded as keystone species because they are the ones to decide what is actually happening in a classroom (Zhao, 2003; Davis, 2011). Therefore, the survival of computer uses depends on their compatibility with teachers' pedagogical beliefs and educational goals. However, this does not imply that educational beliefs are static; rather, they are subject to change just as the species in an ecosystem co-evolve. So, teachers may change their beliefs and classroom practices based on the interaction among different factors and implement novel pedagogies to meet their students' needs.

Finally, when Zhao and Frank (2003) refer to *computer use as living species,* they focus on the fact that computer uses follow a process of evolution similar to that of living creatures. A wide range of technologies are developed based on human needs; and some fit better in the ecosystem and survive while some others are subject to perish as they are not compatible with the demands of the system. Observed in nature as "survival of the fittest", the technologies serving the needs of the ecosystems best will survive and others will become extinct. In education, for example, overhead

projectors, have left their places to projectors that can hook up to a computer in college classrooms.

To summarize, from an ecological perspective, it can be argued that multiple factors at different layers of an educational ecosystem impact teachers' technology use. However, this influence is not equally distributed in different levels in a linear fashion. Rather, they are mediated by what teachers believe the role of technology is in teaching and learning (Zhao & Frank, 2003). Therefore, the framework provides a baseline for examining the multi-faceted factors that are in constant interaction with each other and how they influence teachers' classroom practices with technology, rather than analyzing the interaction between technology use and a list of isolated issues.

Next is the presentation of Davis' (2008; in press) co-evolutionary perspective that was built on Zhao and Frank's (2003) framework. This perspective provides a more robust model by adding a global layer and includes more details about the ecosystem-level factors that might impact teachers' integration of technology.

Davis' Co-evolutionary Perspective

Building upon Zhao and Frank's (2003) framework, Davis (2008; in press) provides a more detailed system-wide perspective on the educational ecosystem by adding the *global* layer. Therefore, each class is considered an ecosystem of its own that is nested within the ecosystem of department, and each department is nested within the ecosystem of school, and each school is nested within the local area, the region and the global biosphere of education which is represented in Figure 2. Figure 2 depicts the diversity of factors that can impact teachers' adoption and integration of digital

technologies. Just like in Zhao and Frank's framework, the teacher is located at the center with a class of students and some existing and new technologies. However, Davis argues that the teacher and students are influenced not only by bureaucratic and political pressures but also by professional and commercial ecosystems.

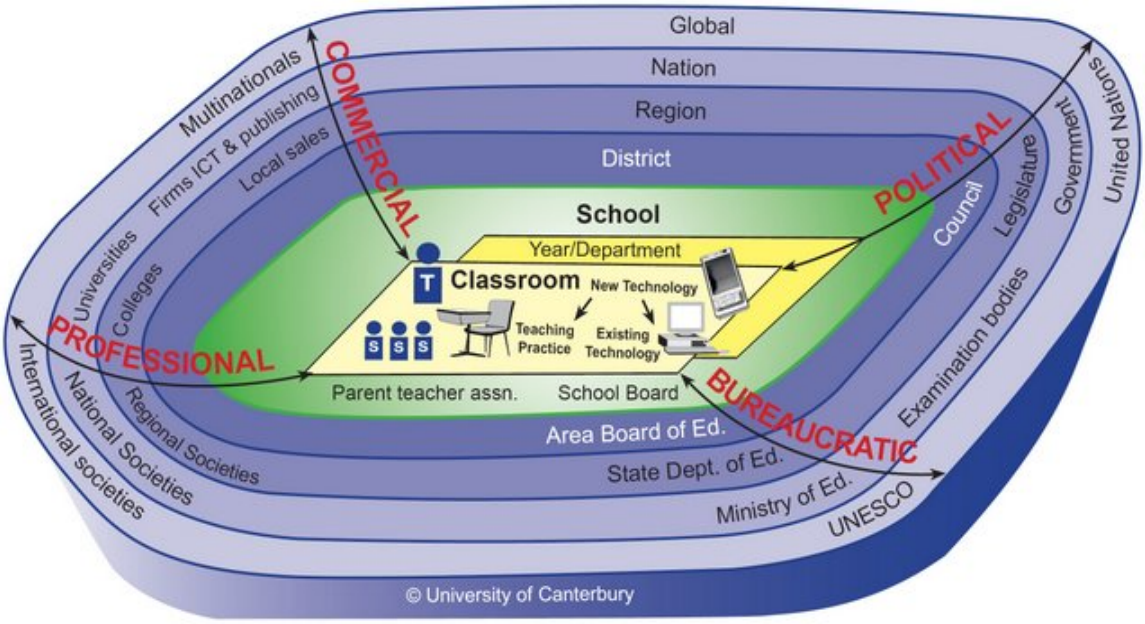

Figure 2. The arena of change for the co-evolution of schooling as a simplified view of the educational systems nested within the global biosphere of primary and secondary schooling (Davis, in press).

Bureaucratic factors pertain to requirements imposed by administrators, including the processes of teacher accountability. *Political factors* are those that originate from community and national politics. *Professional factors* are related to professional development opportunities teachers have within and across schools. For example, they may attend regional, national, or international societies to share experiences, learn from each other and make connections, which may eventually impact their classroom pedagogy and/or technology use. Finally, *commercial factors* refer to

the marketing of new resources including books, multimedia, and computing devices, as well as open educational resources that have emerged alongside commercial materials.

Davis (in press) further claims that although all these organizations reciprocally influence one another and the global educational ecosystem, the teachers' departments in the school have the strongest impact as the closest layer to the teacher. As a result of the interaction among these overlapping ecosystems, teachers either revamp their existing practices or adopt new ones. Namely, as Davis (in press) puts it "the ecology evolves and the evolution of one system will pressure and/or support interacting ecosystems to change". This co-evolutionary ecological perspective can help examine different factors at different layers that influence teachers' uptake or resistance to in integrating technology. This perspective also helps to reveal how those factors overlap and interact with each other in shaping teachers' classroom practices.

In sum, the ecological perspective provides a holistic lens to analyze the multiple factors impacting teachers' technology use and integration. In the next part, the factors that were found to be impacting teachers' technology use and integration in earlier studies will be presented.

Factors That Impact Teachers' Technology Use and Integration

Factors impacting teachers' technology integration and use have been fairly well investigated within the educational literature (Afshari, Bakar, Su Luan, Samah, & Fooi, 2009; Al-Senaidi, Lin, & Poirot, 2009; Baek, Jung, & Kim, 2008; Y. L. Chen, 2008a; Ertmer, 1999; Ertmer et al., 2007; Granger, Morbey, Lotherington, Owston, & Wideman, 2002; Hutchison & Reinking, 2010; Inan & Lowther, 2010a; Lam, 2000; Lu, 2006; Somekh,

2008; Strudler & Wetzel, 1999). Not surprisingly, a pretty extensive list of factors and barriers has emerged.

Ertmer (1999) classified barriers to technology integration into two main categories: external (first order) and internal (second order). External barriers to technology integration are described as "being extrinsic to teachers and include lack of resources, insufficient time to plan instruction, and inadequate technical and administrative support" (p. 48). Internal factors, on the other hand, are directly related to teachers and include beliefs about teaching, beliefs about technology, established classroom practices and resistance to change. External factors are easier to address as it mostly depends on allocating financial resources. Internal factors, on the other hand, may cause more difficulties as they are less tangible and they require fundamental changes in teachers' belief systems and existing teaching practices (Ertmer, 1999).

Although Ertmer's classification of barriers as external and internal has guided the review of factors identified in the literature, the focus here is on "factors" which refer to both barriers to technology integration and factors contributing to successful integration of technology. Studies published after 2000 were included in the review to provide a relatively recent picture of the factors that impact teachers' integration of technology (See Appendix A). The following section provides an overview of the factors that were identified as external ones that impact teachers' technology use and integration.

External Factors

External factors are ones that are extrinsic to teachers and are typically described in terms of resources such as time, availability of and access to technology, training and support (Ertmer, 1999). External factors appear easier to measure and eliminate, as compared to internal factors, as they mostly depend on the availability of financial resources to equip schools with necessary software and hardware (Ertmer, 1999). Specific external factors, identified after reviewing the literature, include the themes of time, access to technology and resources, administrative and technical support, peer interaction, teacher training, professional development opportunities, and student characteristics. Each of these external factors will now be addressed related to teachers' integration efforts.

Time

Time constraints are a reality for teachers (England & Kong, 2007) and have been a barrier frequently cited in technology integration efforts. Lack of time has been identified as a major impediment to technology integration for teachers (Al-Senaidi et al., 2009; Shin & Son, 2007; Van Braak, 2001). For example, in a study conducted in Korea, Shin and Son (2007) examined EFL (English as a Foreign Language) teachers' perceptions and perspectives on Internet-assisted language teaching. Out of the 101 participants, 36% of the EFL teachers rated lack of time as their second highest barrier to using technology. In particular, lack of time in or outside of the classroom, lack of time to identify or create resources and teaching materials as well as limited time for practice or learning about new technologies were among the major reasons for not

using technology for teaching purposes. Teachers already have a limited amount of time during a class period and technology integrated activities might decrease that time because of issues like technical glitches or lack of familiarity with the tools and/or software. In a national survey investigating barriers to ICT (Information and Communication Technology) integration in K-12 literacy instruction, Hutchison and Reinking (2010) reported that 63.7% of 1441 literacy teachers rated *lack of time during a class period* as a moderate or large barrier to their implementation of technology assisted classroom activities.

Time was referred to as an obstacle even in the schools that were "deemed to be engaging in innovative pedagogical practices" (Granger et al., 2002, p. 481). Granger et al. (2002) explored factors contributing to the successful integration of technology in four K-9 schools in Canada. The schools, selected by a panel of educators, administrators, researchers, government representatives, and educational technology experts, were recognized as implementing innovative pedagogical practices using technology. The findings indicated that time—both in and out of class—was one of the two most frequently mentioned obstacles to ICT integration. However, teachers in these schools found creative ways to address "lack of time" issues by planning and teaching in teams as this released some extra time for learning and using simpler programs on slower computers.

L2 teachers also experienced challenges with time during a class period when it involved technology integration. For instance, Egbert, Paulus and Nakamachi (2002) examined how formal CALL instruction transferred to classroom use. Participants in this

study were 20 ESL and EFL teachers who had taken the same graduate level CALL course and started teaching in different parts of the world both at K-12 and postsecondary levels. The results from the survey and interview data revealed that time was identified by all of the teachers who did not use technology as the most important factor that influenced their implementation of technology. One participant specifically stated "the students only get 6 hours of ESL (per week) at each level. Too much to cover" (p. 127). To sum, it appears teachers have difficulty integrating technology-enhanced approaches into their class schedule, as they have to cover a certain amount of content in a given time frame.

In addition, extra time required by teachers to locate or create materials for technology-enhanced activities was deemed to be an obstacle for technology integration efforts for L2 teachers (Lam, 2000). For example, Chen (2008a; 2008b) analyzed how EFL teachers in Taiwan used the Internet and other information and communication technologies in teaching English and identified what kind of factors facilitated or inhibited that usage. Teachers in both studies indicated that finding and creating online learning materials was time consuming, so they were not willing to spend that extra time if they were not sure whether the materials would be effective in teaching the content.

Another time-related issue involves teachers' learning how to use new technologies and/or software that can be used for instruction. In a study that focused on how teachers' comfort levels with technology impacted actual classroom usage, Kessler and Plakans (2008) reported that time required for practice was one factor that

negatively impacted teachers' confidence in using CALL materials. Teachers needed the repetition of practicing with the technology to increase their familiarity and comfort in using different technologies. This simply required more time. Similarly, Chambers and Bax (2006) identified *lack of time* as a major factor impeding normalization of CALL and argued, "for teachers to 'normalise' computer use in their teaching practice, they may need additional time for preparation and planning" (p. 471).

Time, specifically the lack of it, seems to be a major impediment to technology use and integration efforts regardless of the content being taught or the level that teachers teach. Teachers constantly remark that they do not have enough time to locate resources, create materials or learn how to use new technologies and/or software. This lack of time results in limited efforts in using and integrating and use of technology in many institutions despite all the initiatives to encourage innovative technology use to facilitate learning. Now, the discussion turns to the next factor, access to technology and resources, found to be impacting teachers' technology use and integration.

Access to Technology and Resources

Digital divide, which is defined as the gap between who has access to new forms of information technology and who does not (Gunkel, 2003), appears to be improving with recent initiatives like wiring more schools and improving the computer-student ratio. The most recent report by U.S. National Center for Education Statistics indicated that this ratio is 1.7 (Gray, Thomas, & Lewis, 2010b). Even though the computer-student ratio has improved, teachers still report that they do not have access to the technological resources they need to enhance their classroom instruction and cite *lack*

of access as an important barrier to technology integration (Lu, 2006; Van Braak, 2001; Wozney, Venkatesh, & Abrami, 2006). For example, in a study analyzing Canadian elementary and secondary school teachers' technology practices and how their practices were influenced by personal and setting characteristics and teacher attitudes, Wozney, Vankatesh and Abrami (2006) found that access to computer resources *continued to be* a predictor of technology integration. More recent studies also showed access was still considered to be a barrier by most (Hutchison & Reinking, 2010; Kahveci, Sahin, & Genc, 2011). For example, Ebsworth, Kim and Klein (2010) examined technology use of teachers who had taken a graduate level Technology-Enhanced Language Learning (TELL) course. Over half of the participants (57%) who were teaching at elementary and secondary schools in the NewYork City area reported that they had two or three computers in their rooms with no Internet connection or projection capabilities which prevented them from using computers as a teaching tool.

Access to technology is also a barrier listed by teachers particularly in developing countries such as Turkey, Taiwan, Egypt and Iran. For example, Akbaba-Altun (2006) reported *that insufficient hardware and software and a slow Internet connection* were among the major barriers to computer technology integration efforts in Turkish elementary schools. Using national survey data collected from 940 science and mathematics teachers at junior high schools in Taiwan, Wu, Hsu and Hwang (2008) studied the effects of school size on teachers' adoption of technology in classrooms. They demonstrated that there was a significant difference in school resources between users and non-users. These researchers argued that teachers needed sufficient

infrastructure to successfully implement technology in their teaching. In addition to the large student-computer ratio (1 to 46), lack of access to computers created a fear of breaking these expensive tools and therefore resulted in limited use, if any, in Iranian high schools (Zamani, 2010).

Access to resources outside the school is also cited as a factor impacting teachers' integration of technology. In a study conducted in Turkey to examine secondary school teachers' perceptions of computers, Kahveci et al. (2011) reported that *personal computer ownership* was a predictor of higher levels of computer experience which in turn influenced the teachers' attitudes towards using computers in their classrooms.

While lack of access to technology is usually considered to be one of the key factors that impacts technology use and integration, the availability and ease of access to computers and sufficient financial support were found to directly impact teachers' integration and sustainability of any pedagogical innovation (Inan & Lowther, 2010a). On the contrary, researchers in Cyprus surveyed 578 elementary school teachers to determine the factors affecting teachers' teaching with technology and did not find any significant correlation between the technological infrastructure and the teachers' frequency of using technology for instructional purposes (Papanastasiou & Angeli, 2008). This dovetails with Ertmer's (1999) claim that an increase in enabling factors may not automatically result in decreasing the barriers that exist.

Limited access to technologies has impacted L2 teachers' ability to use and integrate technology as well. For instance, teachers who did not use CALL activities in

their teaching listed lack of resources as the third most influential barrier (Egbert et al., 2002). In a mixed-method study administered to 444 ESL teachers in Malaysia, Yunus (2007) examined factors impacting technology usage. The two main challenges these teachers noted were lack of access to computers (81%) and the Internet (76%) for teaching. Likewise, Shin and Son (2007) examined 101 EFL teachers' perceptions and perspectives on Internet-assisted language teaching who were teaching at the secondary level in Korea. Their findings indicated that *limited computer facilities* was listed as the number one reason by 50 teachers who did not use the Internet for teaching purposes. Finally, England (2007) found that EFL teachers in public Egyptian universities did not use computers regularly in their classes due to large class sizes, a lack of facilities and regular access to computers.

Access to technology is still a challenge in educational institutions, particularly in developing countries, and teachers identify it as one of the major factors that impact technology integration at all levels. While lack of access to resources impedes technology use and integration, availability of technological resources appears to contribute fundamentally to integration of technology. With regards to access to resources, it is definitely required but not sufficient (Ertmer, 1999). Teachers might need support from administrators and technical and pedagogical support personnel and that will be discussed in more details in the next section.

Administrative and Technical Support

Support from key stakeholders, such as administrators and technology coordinators, has often been regarded as a critical component of the sustainability of

technology integration efforts (Al-Senaidi et al., 2009; Anderson & Dexter, 2000; Owston, 2007). While administrators play a key role in providing physical and psychological support to teachers while integrating technology (Al-Senaidi et al., 2009; Anderson & Dexter, 2000; Owston, 2007), the presence of technology coordinators ensures that teachers can keep up with the fast and constantly changing nature of computer technology, and that technical issues are addressed in a timely manner (Glazer & Page, 2006; Whitfield & Latimer, 2003).

According to Fullan (2007), the role of school administrators in leading change initiatives is critical and even stated, "I know of no improving school that doesn't have a principal who is good at leading improvement" (p. 160). Technology integration is no different than other educational reforms, and the leadership of administrators in directing, guiding, supporting, facilitating, setting directions and developing people are all qualities of effective school leaders (Fullan, 2007). In a large-scale international study, Owston (2007) examined 174 cases of innovative pedagogical practice in schools in 28 countries. He found that *support from the school principal* was an indicator that contributed to the sustainability of innovative pedagogical practices. Similarly, Anderson and Dexter (2000) identified a significant positive correlation between ICT leadership in schools and the degree of ICT integration in classrooms.

As with other factors, while availability of support from administrators has at times contributed to successful technology integration efforts, lack of it can escalate the concerns teachers have about the role of technology in teaching and learning which results in resistance to using classroom technology. For example, Al-Senaidi et al. (2009)

examined survey data to reveal perceived barriers to adopting ICT in Omani higher education. One hundred faculty members participated and reported lack of *institutional support* as one of the two most important concerns that hindered faculty members' technology adoption.

Administrators also play a key role in seeking funding, offering incentives (i.e. extra stipend and/or release time), and providing resources needed for the sustainability of technology initiatives. Therefore, inadequate administrative support in terms of providing incentives and commitment to funding for resources was cited by teachers as a barrier in technology usage (Y. L. Chen, 2008b). Technology implementation typically requires teachers to spend more time and effort outside of class and if their attempts are not appreciated, they may be discouraged from further exploration and implementation. In a national study of K-12 literacy teachers' ICT integration, Hutchison and Reinking (2010) found that about 60% of their respondents identified *lack of incentives* as a barrier to a small, moderate, or large extent.

Technology can also be unreliable and is prone to technical problems. Therefore, the availability of technology support staff, who can provide just-in-time help and scaffold teacher learning and implementation, is another factor that can impact teachers' technology usage (Glazer & Page, 2006; Whitfield & Latimer, 2003). Several studies list *lack of technical support* as a barrier (C. H. Chen & Reimer, 2009; Kessler & Plakans, 2008; Van Braak, 2001). For example, Meyer, Abrami, Wade and Scherzer (2011) examined the factors influencing Canadian elementary school teachers' use of electronic portfolios and found that low implementers were unhappy with lack of

technical support and were unwilling to spend extra time on something in which they were not supported. Presence of technical support, on the other hand, was found to be as a critical factor in developing confidence and comfort in using CALL activities in teaching languages (Kessler & Plakans, 2008).

The availability of support can also indirectly impact overall use mediated by other factors. Inan and Lowther (2010a) examined factors impacting technology integration in K-12 classrooms using a path analysis approach that allowed them to identify both direct and indirect effects. The results indicated that overall support and technical support positively influenced teachers' beliefs about and readiness to use technology. Because teachers' beliefs about and readiness to use technology were found to positively influence technology integration, Inan and Lowther concluded that technical support indirectly impacted teachers' technology use and integration. Therefore, the perceived support had an indirect impact on teachers' technology integration efforts. In a similar design, the authors looked at the factors impacting instructional use of laptops and they again found that overall support influenced teachers' beliefs, which was the main determining factor in defining their laptop use (Inan & Lowther, 2010b).

Availability of support—administrative or technical—seems to play a role in teachers' decisions and instructional practices involving technology. Working in an educational environment where technology use is encouraged by administrators and supported by technology coordinators or support personnel is very likely to positively influence classroom use of technology, while lack of support might deter its use.

Following is a discussion of a more informal support system, peer interaction, which has been documented to influence teachers' technology integration efforts.

Peer Interaction

Teachers learn about technology in both formal and informal learning environments. One effective informal way of learning about technology is through peer interaction where teachers discuss and learn from each other (Boyd, 1992). As opposed to one-shot, de-contextualized technology workshops, learning in a community of practice ensures ongoing, on-site, and just-in-time support where teachers share ideas and model best practices (Glazer et al., 2005). Several institutions began one-on-one technology mentoring programs where either teacher leaders mentor peer teachers (Glazer et al., 2005) or graduate students mentor faculty (Thompson, Hansen, & Reinhart, 1996). Chuang, Thompson and Schmidt (2003) reviewed such technology mentoring programs and concluded that this type of learning provided opportunities for creating visions for technology integration, individualizing technology support, breaking down hierarchical structure, establishing open dialogue and collaborative relationships, providing mutual benefits for stakeholders, and establishing learning communities. However, educational institutions that do not have well-established technology mentoring programs can still benefit from a climate that is conducive to communication and collaboration among teachers enabling peer support. A strong collegial environment, where teachers share ideas, model best practices, ask difficult questions, and support one another where and when it is most needed is an essential component in technology integration (Glazer et al., 2005). Just-in-time and contextualized help from

colleagues can also help eliminate technical glitches that might disrupt the learning during a class time period (Zhao & Frank, 2003). To highlight the importance of learning in a community of practice, Elmore (2000) stated:

> people make fundamental transitions by having *many* opportunities to be exposed to ideas, to argue them into their own normative belief systems, to practice the behaviors that go with these values, to observe others practicing those behaviors, and most importantly, to be successful at practicing in the presence of others (that is, to be seen successful). In the panoply of rewards and sanctions that attach accountability systems, the most powerful incentives reside in the face-to-face relationships among people in the organization, not in external systems. (p. 31)

Receiving help from colleagues enable teachers to integrate technology into their teaching practices. Teachers who received help from colleagues were more likely to use computers with their students (Zhao & Frank, 2003). Sahin and Thompson (2007) examined the predictive factors influencing faculty members' technology adoption in a College of Education at a large Midwestern university. The results indicated that *collegial interaction* was one of the three variables—the other two were knowledge of data analysis tools and self-directed informational sources—that together predicted the stage of technology adoption by College of Education faculty. Likewise, Papanastasiou and Angeli (2008) identified *encouragement from colleagues* as the second most important factor (among six others) impacting elementary school teachers' teaching with technology. In a national survey, Becker (2000) found that teachers who had

constant interaction and collaboration with their peers on instructional and content-based issues and who also assumed leadership in their profession were the strongest users of technology.

L2 teachers are no different than other teachers in this respect, as they listed their colleagues as the main source of information for different kinds of technology activities (Egbert et al., 2002). Furthermore, their comfort level with technology was impacted by other teachers (Kessler & Plakans, 2008). In a similar vein, teachers in Chen's (2008b) research indicated that they learned better when they interacted and collaborated with their peers, but this interaction was rather limited.

Creating a community of practice where teachers are comfortable exchanging ideas and providing mentorship can be effective for supporting technology use and integration. Implementation of such collaborative approaches may also help to overcome many other barriers by promoting "learning as a natural component and expectation of the teaching community" (Glazer et al., 2005, p.65). Next, the impact of teacher training in technology on technology use and integration will be discussed.

Teacher Training in Technology

With the introduction of personal computers in the early 1980s, every state in the U.S. required teacher education programs to include some type of a computer literacy component in their curriculum (Scrogan, 1989). For most teacher education programs, this requirement was met through a stand-alone educational technology course aimed at developing basic technology skills (Hargrave & Hsu, 2000). Typically, the focus of these courses has been on the use of technology tools with an emphasis on

helping pre-service teachers learn to use various types of hardware and educational (Mehlinger & Powers, 2002).

Early educational technology courses were based on behavioral models, which helped students gain declarative knowledge about educational computing and procedural knowledge of computer literacy (Willis & Mehlinger, 1996). However, students' experiences in these classes did not improve their knowledge of technology integration. For example, Frisbie, Harless and Brunson (1991) designed an educational technology course where students independently went through a series of modules and received credits based on the results of objective tests and hands-on assignments. Findings actually indicated that the technical skills students learned did not transfer to using technology in classroom contexts.

Research findings like this led to a shift in focus toward *technology integration* with several national calls to better prepare pre-service teachers to use technology for teaching and learning (Scrogan, 1989). As a result, an emphasis was placed on using more of a constructivist pedagogy and integrating technology into the curriculum. For example, students participated in hands-on integration activities following faculty modeling (Gunter, 2001); watched exemplary technology-using teachers in videos (Ertmer et al., 2003); collaborated with classroom teachers (Beyerbach, Walsh, & Vannatta, 2001; Jacobsen & Lock, 2004; Wepner, Bowes, & Serotkin, 2005) as well as with methods teachers (Doering, Hughes, & Huffman, 2003); and participated in micro-teaching experiences where they designed technology integrated lesson plans and taught their peers short segments (Foulger, Williams, & Wetzel, 2008).

This evolution of teacher preparation and technology, gradually moving from focusing on isolated skills development to pedagogical integration, may help inform practices in CALL teacher preparation as well. Currently, language teachers' preparation in technology can include a range of possible structures: reading a chapter in a methodology course, participating in in-service workshops, taking a stand-alone CALL course, taking CALL course series, getting CALL certificates and obtaining a graduate degree in CALL (Hubbard & Levy, 2006). In this regard, the most widespread training still seems to be acquired informally through in-service workshops, conferences, personal reading and other forms of self-edification, which indicates that formal language teacher preparation programs have tended to ignore the emerging need of preparing language teachers for a technology-laden society and technologically advanced language classrooms (Kessler, 2006). However, a few studies examined the influence of stand-alone CALL courses on actual classroom usage (Egbert et al., 2002; Kessler, 2007).

Egbert et al. (2002) analyzed how language teachers applied practical experiences from a CALL course to their teaching and found that 70% of the ESL and EFL teachers in the study reported that they used at least one of the activities covered in the CALL course in their own teaching. However, the researchers noted that many of those teachers used some of the CALL activities in their teaching even before they took the course, so personal exigency rather than coursework was a better determiner of teachers' technology use and integration. Based on these findings, they suggested that CALL teacher preparation courses should cover how to transfer personal technology use to classroom use as well as theory and skills of CALL.

Similarly, Kessler (2007) surveyed 108 randomly selected TESOL (Teaching English to Speakers of Other Languages) masters degree graduates in North America to determine the role of formal and informal CALL related training opportunities and found that formal preparation was not influencing graduates' attitudes toward technology. Rather, these graduates continued to rely upon informal, ad-hoc methods of preparation.

In another study, Chen (2008b) argued that teacher training in technology use was important in helping language teachers use the Internet in their classrooms. He found that active Internet users were ones who received a technology-related degree or who had taken technology courses. It was much easier for them to locate resources and know how to use those resources once located compared to other EFL teachers with no technology background.

Previous research provides conflicting results in terms of the impact of formal teacher training on teachers' actual classroom use and integration. Having discussed the role of formal teacher training in pre-service teacher education in technology use, the discussion now turns to the impact of professional development activities provided for in-service teachers.

Professional Development

Professional development in educational technology is important mainly for two reasons. First, in-service teachers who received their degrees in the past probably did not have the chance to receive any training during their teacher preparation program. Second, technology—computer technology in particular—changes so fast that it forces

teachers to continually learn innovative ways to use technology that will enhance their teaching. Specifically, the impact of professional development on teachers' technology use was examined by analyzing the effect of certain professional development initiatives (Brinkerhoff, 2006; Lowther, Inan, Strahl, & Ross, 2008) or by how it was cited as a key factor among others influencing teachers' decision about classroom technology adoption (Y. L. Chen, 2008b; Inan & Lowther, 2010b; Yunus, 2007). In either case, findings provided contradictory results in terms of the effectiveness of professional development and its influence on technology use and integration in classrooms.

Brinkerhoff (2006) reported the impact of using the Technology Academy Model (TAM) for professional development. The purpose of the TAM was to "expand teachers' understanding and abilities with instructional design, the use of technology as a support for student instruction, and student-centered instruction that requires higher-order thinking skills" (p. 25). The TAM was designed as a long-term intervention for K-12 teachers and barriers (i.e. teachers resistance to participation in professional development, overemphasis on skills and insufficient focus on instructional ideas, and insufficient support) were addressed before the sessions started so that teachers could get the maximum benefit out of their professional development experiences. Both quantitative and qualitative data were collected to analyze the impact of the TAM on technology skills, computer self-efficacy, and technology integration beliefs and practices. The findings indicated that as a result of the TAM experiences, teachers perceived an increase in their technology skills; they felt less fearful and confident

toward technology, and their attitudes and teaching practices had altered in favor of technology integration.

In a similar study, Lowther et al. (2008) reported the results of a technology integration initiative called the Tennessee EdTech Launch. The purpose of this initiative was to help K-12 teachers implement technology as a tool into the curriculum by preparing their students to meet state academic standards. Each school was assigned a technology coach to provide comprehensive professional development intervention for teachers in their own schools. Before the program was launched, the researchers addressed the key barriers to technology integration based on a careful review of findings from previous research. The results indicated that teachers utilized computers more with higher-quality experiences for students, as compared to teachers who did not participate in the program.

In addition, teachers who participated in professional development activities focused on technology integration felt more comfortable developing technology-enhanced materials for their classrooms. Y. L. Chen (2008a), on the other hand, concluded that teachers found workshops focusing on technological skills ineffective and wanted to learn more about the pedagogy behind technology integration (Y. L. Chen, 2008a). Therefore, teacher development offered in a collaborative mode—as opposed to top-down training mode—where teams of experts work with non-experts might be more productive (Chambers & Bax, 2006).

Supporting data indicate that opportunities for professional development that focus on how technology can be used to improve instruction appear to be affecting

teachers' technology use and integration. Lack of computer training possibilities and lack of technology oriented pedagogy challenge using technology for instructional purposes (Yunus, 2007). Another external factor impacting teacher's technology use and integration is related to students, which will be presented next.

Student Characteristics

Student characteristics such as technical skills, cognitive abilities, and their access to technology outside the class impact teachers' decisions about how they use technology in their classrooms or whether to pursue implementing technology-enhanced activities. For example, in a U.S. national survey, it was found that students who were labeled as low-achievers used technology for low cognitive level activities (e.g. drill-and-practice) while high-achieving students used more advanced technologies (e.g. spreadsheets, database) for higher cognitive activities (Becker, 2000).

Students' insufficient technical skills appear to be discouraging for teachers trying to infuse technology in their teaching. Osika, Johnson and Bueta (2009) surveyed randomly selected 75 faculty members to examine the factors that influenced faculty members' decisions about whether or not to integrate online technologies into their courses. These researchers found *student abilities* to be negatively impacting faculty members' technology use and integration as it requires them to spend more time with students on technical issues rather than instructional ones. Language teachers raised a similar concern. For example, Shin and Son (2007) surveyed 101 EFL teachers teaching in Korean secondary schools to examine their perceptions and perspectives on the use of Internet for language teaching purposes. Students' limited computer skills were one of

the most cited barriers for using and integrating technology. In another study, Lam (2000) investigated the reasons behind language teachers' decisions to use technology for teaching and what factors influenced these decisions. The results indicated that students' background was an important factor. Participants in this study mentioned that students who had never seen or used certain technologies in their daily lives felt threatened with the way they were integrated in their language classrooms and that negatively impacted teachers' instructional practices (Lam, 2000).

Language teachers were also concerned about their students' technology access outside the school (Shin & Son, 2007; Winke & Goertler, 2008; Yunus, 2007). In a study that investigated foreign language learners' computer access and literacy, Winke and Goertler (2008) found that although the majority of the students owned a personal computer, fewer of them had access to microphones and webcams which were extensively used in CALL activities. In addition, students failed to transfer their daily use of certain technologies to their instructional contexts. For example, although they used a lot of technologies in their daily lives (e.g. e-mail, Internet surfing and chatting) they were less familiar with more advanced features that were used in language classrooms (e.g. multimedia graphics in word-processing programs, creating audio or video files, or working with advanced features in word-processing programs). Therefore, the authors argued, "poor access and/or literacy in using such tools will make practice difficult or anxiety laden" (Winke & Goertler, 2008, p. 493)

As stated earlier, schools are closing the digital gap by providing resources and equipment; however, it does not ensure that students will have access to technologies

they need outside the classroom (Becker, 2000). In particular, they seemed not to have technologies required for language learning tasks (Winke & Goertler, 2008; Zhao, 2003). Furthermore, students' lack of access to technology outside of the classroom seemed to be influencing their technical skills which in return impacted what teachers could do in the classroom and to what extent they would be willing to allocate time for technical training for students who will use the time allocated for teaching their subject matter (Winke & Goertler, 2008).

In sum, external factors which are not directly related to teachers themselves include *time*, *access to technology and resources*, *administrative and technical support*, *peer interaction*, *technology teacher training*, *professional development*, and *student characteristics*. After discussing each of these external factors, the discussion now turns to internal factors that are intrinsic to teachers.

Internal Factors

Internal factors impacting teachers' technology use and integration are specific to teachers themselves. The internal factors related to technology use and integration that are identified in the literature include *demographics*, *technical skills*, *pedagogical beliefs*, and *content area taught*. Compared to external factors, internal factors are harder to address or eliminate as they require "challenging one's belief systems and the institutionalized routines of one's practice" (Ertmer, 1999 p. 48). The next few sections provide an overview of how these factors impact teachers' technology use. The first, demographics, will be discussed.

Demographic Factors

Demographic factors such as age, years of experience gender, and gender were identified as ones that impact teachers' selecting to use technology or not. For instance Baek, Jung and Kim (2008) explored the factors affecting the facilitation of technology with 64 Korean K-12 teachers. The findings indicated that experienced teachers used technology, oftentimes involuntarily, to meet external requirements and cared very little about how they could improve their teaching through technology-enhanced activities, while teachers with little experience were more likely to use it on their own.

In another study, Inan and Lowther (2010a) surveyed 1382 K-12 teachers in the U.S. to identify the factors that affect technology integration in K-12 classrooms. The results indicated that age and years of teaching negatively impacted their computer proficiency and technology integration. That is to say younger teachers tended to use technology more so than older teachers. In contrast, Meskill, Mossop, DiAngelo and Pasquale (2002) compared and contrasted the "technology talk" of expert teachers (experienced teachers and technology users) and novice teachers (limited experience in teaching and teaching with computers) of K-8 language and literacy. The findings indicated that expert teachers embraced every opportunity to increase the potential of computers in facilitating teaching and learning, while novice teachers regarded technology just as a tool and a way to reward the students. In their study of the impact of primary school teachers' educational beliefs on the classroom use of computers, Hermans, Tondeur, Van Braak and Valcke (2008), did not find age to be statistically significant factor in determining whether teachers integrate technology or not.

Gender was another demographic factor that was found to influence technology integration efforts of teachers. Males tended to use technology more than their female colleagues did (Hermans et al., 2008; Kahveci et al., 2011). However, in some other studies, no significant correlation was found between the level of technology use and gender (Jones, 2004; Lam, 2000).

In short, evidence exists that teachers' demographic factors such as age, years of teaching experience, and gender have an impact on teachers' technology use in one way or another. However, further investigation of the related external factors might help address issues related to demographic factors. Now, another internal factor, teachers' level of technical skills and daily computer use, is further explained.

Technical Skills and Daily Computer Use

Teachers' *technical skills and daily computer* use was included as a factor influencing their technology integration practices. Some studies found that teachers' actual knowledge and use of different software for personal and professional purposes was an important determiner to the successful technology integration in schools (Becker, 2000; Hermans et al., 2008; Papanastasiou & Angeli, 2008). For example, Kennedy and Levy (2009) shared that language teachers' technical and pedagogical skills contributed to the success of CALL integration in teaching Italian. In this study, teachers were confident in designing and managing their projects on their own which helped them address technical and pedagogical issues themselves without needing any technical support personnel.

Wozney et al. (2006) surveyed 764 elementary and secondary teachers in Quebec to investigate the factors that influenced the degree to which computer technologies were implemented into teaching and learning practices and they reported that teachers' *daily computer use* was the strongest predictor of classroom technology use because they had time to play and learn with different tools. Osika et al. (2009) analyzed the factors impacting faculty members' adoption of course management systems and identified that faculty members who were comfortable using technologies in other areas of work were more inclined to use technology for instruction.

Other researchers found that teachers' technology use outside the school negatively impacted students' content acquisition (Baylor & Ritchie, 2002). Baylor and Ritchie (2002) conducted a comprehensive study of 94 K-12 classrooms from four states in different geographic regions of the United States to investigate the factors that impacted teachers' technology integration. The results indicated that the higher the level of technical skills of teachers, the more they focused on technology itself rather than seeking ways to enhance student learning via technology.

Lam (2000) conducted a case study to examine the reasons behind language teachers' decisions to use technology for teaching and found that *lack of confidence in computer skills* was one of the main reasons for not using technology. Kahveci et al. (2011) surveyed 130 secondary school teachers in 3 schools in Turkey to examine teachers' perceptions of computers. The results indicated that *computer experience* had significant effects on teachers' attitudes towards computers and confidence in technology integration.

Overall, the findings in the literature indicated that teachers' technical skills can have both positive and negative influences on teachers' classroom technology practices depending on why and how they use technology. Without a doubt, having the required technical skills definitely streamline the technology integration process (Becker, 2000; Hermans et al., 2008; Papanastasiou & Angeli, 2008). However, it is also quite possible to be caught up in the 'coolness' of technology that it may be integrated just for the sake of technology rather than for enhancing learning (Baylor & Ritchie, 2002). This further implies that just acquiring technical skills is not sufficient; rather, teachers need to know or at least learn sound pedagogical ways of using technology effectively (Mishra & Koehler, 2006). Thus this leads the discussion to the next internal factor—pedagogical beliefs.

Pedagogical Beliefs

Teachers maintain a set of beliefs that determine their priorities for pedagogical knowledge and classroom practices (Liu, 2011). These pedagogical beliefs are created through a process of enculturation and social construction, and include three main components: incidental learning, education, and schooling. These beliefs remain unaltered unless they are deliberately challenged (Pajares, 1992). The more strongly teachers believe that computers are compatible with their particular teaching styles, the more often they report using computers for both organizing teaching and using these tools with students in innovative ways (Zhao & Frank, 2003). Owston (2007) also argued "Teachers have to believe that what they are doing in the classroom has merit before they are likely to give wholehearted support" (p. 70). Teachers' beliefs about the role of

technology in teaching and learning follow a similar path (Ertmer, 2005) and previous research indicates that pedagogical beliefs highly influence teachers' practice and level of technology implementation.

Teachers' pedagogical beliefs were identified as an influential factor in two ways. Several researchers have directly analyzed the impact of pedagogical beliefs in technology integration (Hermans et al., 2008) or identified pedagogical beliefs as one of the many other factors impacting teachers' decisions (Inan & Lowther, 2010a; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Papanastasiou & Angeli, 2008; Wu et al., 2008).

In one study, researchers specifically analyzed the influence of elementary school teachers' educational beliefs on technology integration surveying 525 teachers from 68 schools in Flanders (Hermans et al., 2008). They found empirical evidence supporting the hypothesis that teachers' beliefs about the practice of teaching were significant determiners of the adoption or non-adoption of classroom technology use. In particular, teachers who held a constructivist teaching philosophy were more inclined to use technology for teaching and learning purposes. Several other researchers also reported that teachers with constructivist or student-centered beliefs were more likely to use technology for higher cognitive level learning tasks in their teaching (Becker, 2000; Y. L. Chen, 2008b; Tondeur, Hermans, Van Braak, & Valcke, 2008; Wozney et al., 2006).

In contrast, one researcher analyzed the relationship between teachers' beliefs, teaching activities, and technology integration among 1139 elementary school teachers

in Taiwan and found that the majority of teachers with learner-centered beliefs still used lecture-based pedagogy when integrating technology into instruction (Liu, 2011). Drent and Meelissen (2008) studied the factors that stimulate or limit the innovative use of ICT by teacher educators in the Netherlands and found that student-oriented approaches had a direct impact on innovative technology use.

Granger et al. (2002) analyzed 12 K-12 schools in Canada where technology was successfully integrated and they found that teachers in these schools viewed technology as a tool and searched for ways to use technology to enhance student learning. Ertmer et al. (2007) identified the factors influencing success by exemplary technology-using teachers, and *inner drive* and *personal beliefs* were rated as the most influential reasons. However, pedagogical beliefs on its own may not necessarily be sufficient for successful technology integration.

If teachers tend not to believe in the pedagogical value of technology, they have a higher likelihood of rejecting it. For instance, language teachers were the most frequent users of Computer Mediated Communication (CMC) technology because they believed CMC activities provided authentic audience for their students (Van Braak, 2001). However, other content teachers did not perceive CMC as a useful tool for teaching their content and therefore chose not to use it.

Teachers' beliefs about what is efficient in achieving their learning objectives, in this case using technology, seem to be a key determiner of whether and how they use technology. Innovation introduced at the school level needs to be compatible with teachers' existing beliefs to be sustainable (Rogers, 2003). Teachers with constructivist

beliefs tend to use technology more frequently and for more creative and high-level tasks while the ones with behaviorist beliefs tend to use it to perpetuate their existing beliefs. That last internal factor discussed is the content area taught by the teacher.

Content Area Taught

Some technologies may lend themselves better to learning in certain content areas that might affect teachers' preferences for opting to use them or not. Harris and Hofer (2011) argue that each content area should separately and carefully be considered when decisions are made about how educational technologies are applied. For instance, van Braak (2001) found that K-12 language teachers were more familiar with the use of CMC than other content teachers and they were likely to use it more than other content teachers. Likewise, Kahveci et al. (2011) found that there was a positive correlation between technological aversion and the content area that teachers teach. However, these researchers failed to report in their findings, which content area(s) teachers were less inclined to use technology in their teaching. Zhao and Frank (2003) also found that teachers of English were more likely to use computers, in particular, word processing as a tool for writing.

In sum, internal factors impacting teachers' decisions and practices in technology integration are intrinsic to teachers themselves. Internal factors identified after reviewing the literature include *demographics*, *technical skills and daily computer use*, *pedagogical beliefs*, and *content area taught*.

Chapter Summary

A review of the literature indicated that there are several factors influencing teachers' use of technology for instructional purposes, which could be categorized as external and internal factors. External factors are defined as the factors that are extrinsic to teachers and they are considered to be easier to address compared to internal factors as long as financial resources are made available. Internal factors, on the other hand, are intrinsic to teachers as they require challenging teachers' existing beliefs that they have formed over the years. Table 1 summarizes the external and internal factors identified after reviewing the literature and the studies citing each factor.

As seen in Table 1, previous research resulted in a long list of factors that influenced teachers' decisions and practices in technology integration into instruction. The isolated focus on discrete factors has disregarded the messy and complex interaction among different variables that might be in constant interaction with each other in affecting overall technology use. Adopting a unifying theoretical framework and focusing on the contextual factors might better explain the reasons for technology use or lack thereof what teachers do in their classrooms with technology. In this regard, to present a more robust picture of the factors impacting university-level language teachers' technology use, this study adopts an *ecological perspective* as the theoretical framework for study. The ecological perspective provides a holistic lens to analyze the factors impacting language teachers' technology integration and helps identify the teacher and ecosystem-level factors impacting university-level language teachers'

Table 1

Overview of studies that examined the factors impacting teachers' technology use and the factors they identified

	Factors	Studies
External	Time	Al-Senaidi et al. (2009); Chambers & Bax (2006); Y. L. Chen (2008a; 2008b); Egbert et al. (2002); England & Kong (2007); Granger et al. (2002); Hutchison & Reinking (2010); Kessler & Plakans (2008); Lam (2000); Shin & Son (2007); van Braak (2001)
	Access to technology and resources	Akbaba-Altun (2006); Ebsworth et al. (2010); (England (2007); Egbert et al. (2002); Hutchison & Reinking (2010); Inan & Lowther (2010a); Kahveci et al. (2011); Lu (2006); Papanastasiou & Angeli (2008); van Braak (2001); Shin & Son (2007); Yunus (2007); Wozney et al. (2006); Wu et al. (2008); Zamani (2010);
	Administrative and technical support	Al-Senaidi et al. (2009); Anderson & Dexter (2000); Y. L. Chen (2008); Chen & Reimer (2009); Glazer & Page (2006); Hutchison & Reinking (2010); Inan and Lowther (2010a); Inan and Lowther (2010b); Kessler & Plakans (2008); Meyer et al. (2011); Owston (2007); van Braak (2001); Whitfield & Latimer (2003)
	Peer interaction	Becker (2000); Chen (2008); Egbert et al. (2002); Glazer et al. (2005); Kessler & Plakans (2008); Papanastasiou & Angeli (2008); Sahin & Thompson (2007); Zhao & Frank (2003)
	Teacher training in technology	Chen (2008); Egbert et al. (2002); Kessler (2007);
	Professional development	Brinkerhoff (2006); Chambers & Bax (2006); Y. L. Chen (2008); Inan & Lowther (2010b); Lowther et al. (2008); Yunus (2007
	Student characteristics	Becker (2000); Lam (2000); Osika et al. (2009); Shin & Son (2007); Winke & Goertler (2008); Yunus (2007); Zhao, (2003)
Internal	Demographics	Baek, Jung and Kim (2008; Hermans et al. (2008); Inan and Lowther (2010a); Jones (2004); Kahveci et al. (2011); Lam, (2000); Meskill et al. (2002)
	Technical skills and daily computer use	Albirini (2006); Baylor & Ritchie (2002) Becker (2000); Hermans, et al. (2008); Kahveci et al. (2011); Kennedy & Levy (2009); Lam (2000); Lu, (2006); Papanastasiou & Angeli (2008); Shin & Son (2007); Yunus, (2007); Wozney et al. (2006)
	Pedagogical beliefs	Becker (2000); Y.L. Chen (2008); Drent & Meelissen (2008); Ertmer (2005); Ertmer et al. (2007); Granger et al. (2002); Hermans et al. (2008); Inan & Lowther (2010a); Liu (2011); Owston (2007); Papanastasiou & Angeli (2008); Tondeur et al. (2008); van Braak (2001); Wozney et al. (2006); Wu, et al. (2008); Zhao & Frank (2003);
	Content area taught	Kahveci et al. (2011); Van Braak (2001); Zhao & Frank (2003)

decisions and practices of technology use. Therefore, the framework provides a baseline for examining the multi-faceted factors that are in constant interaction with each other and how they influence teachers' classroom practices with technology.

This chapter presented a review of the literature that analyzed the factors impacting teachers' decisions on technology use. It started with a description of the theoretical framework, ecological perspective (Davis, 2008, in press; Zhao & Frank, 2003) that is used in this study. Then, external and internal factors identified in previous educational technology and CALL literature were synthesized and summarized. The next chapter explains the research methodology, participants, procedures, data sources and data analysis.

CHAPTER 3: METHODOLOGY

In this chapter, the research design of this dissertation study is outlined in detail. The research methodology section presents the methodology chosen for this study and explains the rationale for the choice of a qualitative case study approach to data collection. Following this is a description of the research context, participants, data collection techniques and materials, research procedures, and data analysis.

Research Methodology

In this dissertation a qualitative case study methodology was used to examine the factors impacting university-level language teachers' technology integration. The philosophical worldview is that of social constructivism. According to Cresswell (2003) and several others (Lincoln & Guba, 2000; Neuman, 2000; Schwandt, 2000), the main assumption of social constructivism is that "individuals seek understanding of the world in which they live and work" (Creswell, 2003, p. 8). Therefore, they develop subjective meanings of their experiences that may be varied and multi-faceted. This philosophical approach is befitting of a qualitative research approach since a major feature of qualitative research is also that people *construct* reality in interaction with their social worlds (Merriam, 2009). Therefore, the researcher can interpret how people make sense of their experiences; how they construct their worlds, and what meanings they attribute to their experiences by carefully listening to what people say or do in their life settings.

The goal in this research study then, from a social constructivist perspective, was to rely as much as possible on the participants' viewpoints of the phenomenon through

broad, general, and open-ended questions. Additionally, this study focused on specific contexts in which people work in order to better understand the historical and cultural settings of the participants. The overarching goal was to make sense of the 'meanings' participants have about the role of technology in language teaching and explore how those meanings are constructed (Creswell, 2003).

This study adopted a case study methodology, which is defined as:

> a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g. observations, interviews, audiovisual material, and documents and reports), and reports a case description and case-based themes (Creswell, 2007, p. 73).

The single most defining characteristic of case study research lies in delimiting the object of study—the case. Therefore, the unit of analysis characterizes a case study—not the topic of investigation. In a case study, the unit of analysis is a bounded system around which there are boundaries. These boundaries can be defined at different levels depending on the purpose of the research. The case then could be a single person who is a case example of some phenomenon, a program, a group, an institution, a community, or a specific policy (Merriam, 2009).

Yin (2008) distinguishes among four different case study designs based on a 2x2 matrix as seen in Figure 3. The dotted lines between a case and its context imply that

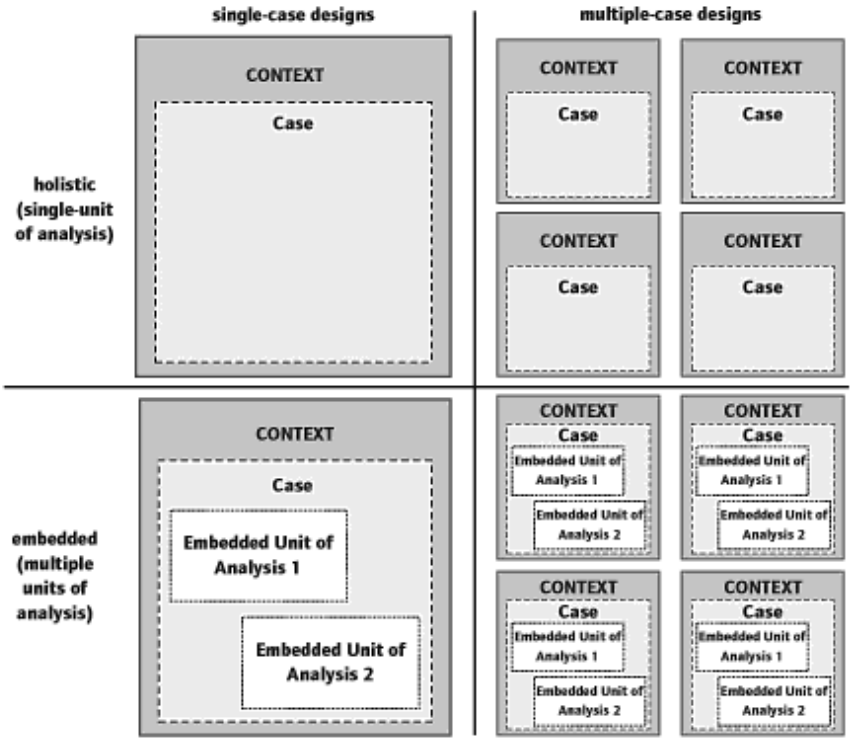

Figure 3. Basic types of designs for cases studies (Yin, 2008)

the boundaries between the two are likely to be permeable and the contextual factors related to the case are an interest to the researcher. The matrix then shows the single- and multiple-case studies. As their names indicate, single-case studies examine one case while multiple-case studies include more than one case each within its individual context. Within these two types there can be holistic and embedded case studies based on the number of units of analysis. In holistic studies the unit of analysis is the case itself while in embedded designs there are two or more units of analysis within the single case.

This dissertation study follows a single-case study design with three embedded units of analysis, which can be seen in Figure 4. The case is bounded at the institutional level and represents language teaching at a large Midwestern university.

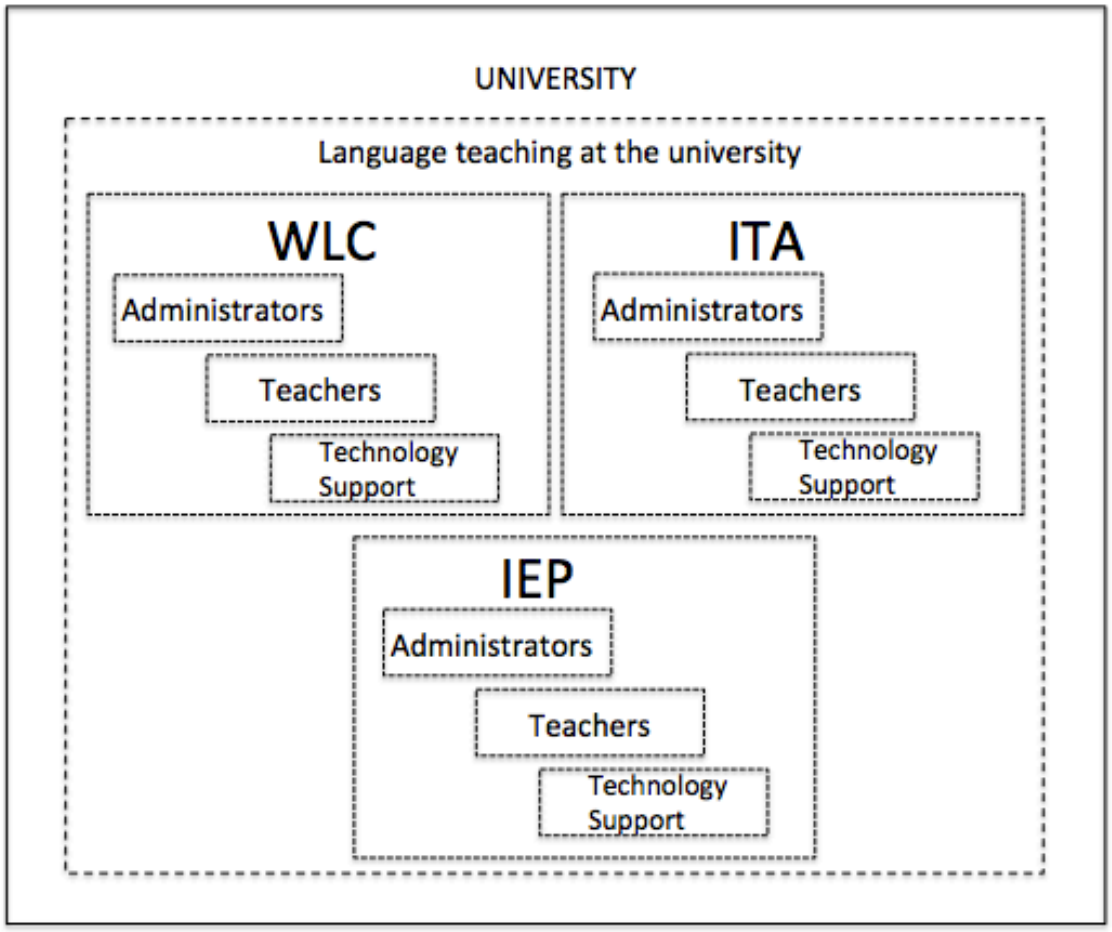

Figure 4. Single-case study design with three embedded units

The embedded units of analysis are the three language teaching programs at the university: World Languages and Cultures, Intensive English Program, and International Teaching Assistant Program. Participants (exemplary technology-using language teachers and limited technology-using language teachers) included in three units of analysis also define the case.

To further define case studies, Merriam (2009) categorizes case studies into three types based on their special features: particularistic, descriptive, and heuristic. *Particularistic* case studies focus on a particular situation, event, program or phenomenon. In particularistic case studies, the case itself is important for what it

reveals about the phenomenon under investigation. *Descriptive* case studies provide a "thick description" — that is to say a complete and literal description— of the phenomenon or entity under investigation. *Heuristic* refers to "case studies that illuminate reader's understanding of the phenomenon under study" (Merriam, 2009, p. 44). Therefore, heuristic case studies can reveal alternative meanings, extend the reader's experience, or confirm what the reader already knows. This single-case study is a heuristic case study because it aims to provide an alternative perspective to the existing literature on factors and barriers that might reveal unknown variables and relationships, and consequently cause to modify existing generalizations, or to reinforce existing generalizations through vicarious instances and episodes.

Qualitative case study design is appropriate for this study because it can produce in-depth knowledge about the factors impacting university-level language teachers through a holistic description and explanation (Merriam, 2009). Case study design is particularly suited to situations in which it is impossible to separate the phenomenon's variables from their context (Yin, 2008). This study aimed to reveal contextual factors—ecosystem-level factors in an ecological sense—that impact technology use and integration in language teaching. Therefore, the case study design provided a venue for exploring such contextual factors that interact with each other. In addition, case study gives the participants a voice and an opportunity to present their views, which allows the researcher to interpret participants' sense making of the phenomenon under investigation. Following is a description of the research context.

Research Context

The study was conducted in one department and two programs that were teaching languages at a large land-grant university in the Midwest of the US. In Fall 2012, over 28,000 students from all 50 states and more than 110 countries were enrolled at the university. The international students represented 12.5% of the student population. Languages are taught in four major units at this university: World Languages and Cultures, International Teaching Assistants Program, Intensive English Program (IEP) and the ESL program in the English department. This study includes language teachers from the first three aforementioned programs; the ESL program did not respond to the research invitation e-mail, so they were not included in the study. The three participating units will be described now.

Department of World Languages and Cultures. Several languages are offered in the Department of World Languages and Cultures (WLC). Namely, students can obtain a major in French, German, and/or Spanish; they can minor in Chinese Studies, French, German, Latin, Russian Studies and Spanish. Course work in Arabic and Greek are also available. The French, German and Spanish programs offer the possibility of either majoring solely in the language or combining it with any of the other university majors. The Chinese Studies Program offers language courses from elementary through advanced levels and interdisciplinary courses on contemporary Chinese literature culture and film. The Arabic Studies program currently offers beginning and intermediate level classes in Modern Arabic. The Classical Studies Program offers

language courses in Latin and Ancient Greek from beginning to advanced levels ("About the Language Studies Resource Center", 2012)

The WLC Department also has a Language Studies Resource Center (LSRC) and its mission is to provide “students with the specific resources and services that will improve the quality of their language learning experiences in the classroom, the LSRC facilities or online.” ("About the Language Studies Resource Center", 2012) It is stated that the LSRC will fulfill its mission by:

- validating language learning across the curriculum and raising awareness of the complexity and value of language studies in an international curriculum;
- promoting awareness of the centrality of the study of languages and cultures in the achievement of the university and department's common goal of developing culturally informed global citizens;
- providing resources, expertise and support for the learning and teaching of world languages and cultures;
- *supporting the meaningful integration of technology into world language learning and teaching;*
- *facilitating faculty development in the area of technology integration;*
- increasing the flexibility of its services;
- functioning as an extension of the classroom;
- *functioning as incubator for innovative technology-enhanced instructional projects;*

- interacting and collaborating with other campus units. ("About the Language Studies Resource Center", 2012, italics added)

The LSRC is the primary resource for students enrolled in world language classes who seek access to audio, video, textual and electronic materials in support of their language studies. The center also serves as the instructional technology hub of the department, providing specialized media resources and support for language and culture classes.

In addition, the LSRC runs a digitally-enhanced classroom, which began in 2003 with a donation from an international corporation. The equipment available in the classroom includes multimedia workstations with individual headset microphones for each student and teacher, an interactive whiteboard, an ELMO document camera, a video-conferencing system, equipment for playback of analog and digital video in all formats available worldwide, and a PolyCom system. The interactive whiteboard allows the presenter to manipulate projected content on the board by touching the whiteboard directly. All of the information written on the interactive whiteboard can be saved and made available online to class participants. The digitally-enhanced classroom is also equipped with an Elmo projector and with media players that can reproduce content stored in any of the standard media formats available worldwide (multi-format VCR and region-free DVD player). Finally, the PolyCom system allows students and teachers to communicate and collaborate between remote sites with compatible equipment.

In addition to the digitally-enhanced classroom, several other resources are available for students and teachers such as a satellite TV, a media collection and subscriptions, VHS tapes and DVDs. All resources can be searched by language area or genre. Students who are majoring in a WLC program or taking a class in the department may request an account to access the online resources and check out materials. Likewise, faculty can check out materials, access online resources, reserve classrooms and laptop carts and offer suggestions for resources. As a key component of the WLC department, LSRC serves both students and teachers in providing resources as well as technical and pedagogical support.

The LSRC also collaborates with faculty members in several projects. For example, they initiated the integration of Horizon Wimba Voice Tools to the learning management systems used campus-wide; they also developed a hybrid Spanish course and online Latin courses through grants offered on campus.

International Teaching Assistant Program

The International Teaching Assistant (ITA) Program aims to support international graduate assistants with teaching responsibilities by helping them improve their oral communication skills and successfully participate in various instructional roles. In its mission statement, it is underscored that the needs of ITAs are identified and addressed through testing, providing instructional support grounded in theory and research in language testing and enhancing their support and service with cutting-edge technology.

All international graduate students who have teaching assistantships are required to take an Oral English Certification Test administered by the ITA program. The

test is composed of two parts: the Oral Proficiency Interview (OPI) and the TEACH teaching simulation. OPI is rated by an interviewer and 2-3 other trained raters. In the TEACH section, the test takers teach a short segment from their content area and are rated by 2-3 raters and a proctor. The OPI and TEACH scores are combined and a composite score is given to place the students in one of four possible levels of certification:

Level 1: Fully certified

Level 2: Conditionally certified

Level 3: Certified with Restrictions

Level 4: Not certified

Students who are placed in Level 1 are not required to take any additional language classes. Level 2 students are required to take one semester of coursework to improve their communication skills. This course must be taken during or before the first semester of teaching duties. At the end of the class, they can either be directly upgraded to Level 1 or encouraged to take the test again based on their advisor's recommendation. Level 3 students are required to take one or two semesters of course work depending on their scores and be retested at the end of each semester. Finally, Level 4 students are required to take 2-3 semesters of coursework with retesting at the end of each semester. These three courses in communication skills aim to improve the intelligibility and comprehensibility of international teaching assistants' speech.

In addition to the course work, students in the lower three levels are also required or recommended to do some independent lab work via a variety of

pronunciation software. Students can either reserve time slots to work on their individual pronunciation problems or check out a laptop with the required software installed. In addition to the pronunciation lab, other facilities in the ITA program include laptops for teacher and student checkout, laptop carts, flip cameras, and pinnacle devices. Pinnacle is a video capturing and transfer device, which enables teachers to easily record student presentations and upload those presentations to a course management system.

Intensive English Program

Intensive English Program (IEP) offers English as a Second Language (ESL) instruction to non-native speakers "to improve their English proficiency, prepare for academic study, and enhance their professional development, intercultural relationships, and interpersonal communication" (IEP Faculty Handbook, 2007, p. 1).

Students who fail to meet the language requirements as defined by the university attend IEP classes full-time, i.e. 21 hours of instruction over five days a week. Classes are organized based on skill areas (i.e. Oral Communication, Reading, Writing, Grammar, and TOEFL preparation) and levels of proficiency distributed in six levels ranging from low-beginner to advanced. Students are placed at these levels based on their scores on the placement exam administered by IEP.

Instruction mostly takes place in regular classrooms on campus that are shared with many other departments. Some of these classrooms are equipped with media stations that include a media player, a projector, and a document camera. Not all the classrooms are equipped with technology, so what teachers get is completely

unpredictable. However, teachers have the opportunity to hold the classes in a computer lab once a week. These labs are also scattered around the campus and may be equipped with different types of computers and other technologies.

IEP has a Language Learning Lab that offers a computer lab with 20 computers for students to work on their own materials and a lending library, which includes books, audio and video recordings. On Tuesdays and Thursdays, from 3:30 to 5:00 pm a tutor is available to answer students' questions and guide them with their work. All IEP students are encouraged to utilize the lab as much as possible.

In sum, the three embedded units of analysis were the Department of WLC, the IEP, and the ITA program. Next, participants representing each unit will be presented.

Participants

Participants[1] in the study were three administrators, three technical and pedagogical support personnel, and eight teachers. The administrators included a department chair, a program coordinator, and a program director. The teachers were selected based on the input received from the administrators: the administrators were asked to nominate two teachers from their area who use technology frequently and in exemplary ways and two teachers whose technology use was limited. They had difficulty in nominating teachers with limited technology use because most teachers used some kind of technology either for instruction or for class management purposes (e.g. online gradebooks and materials). Therefore, out of the eight teachers only two of them were identified as low-technology users. The other six were nominated by their

[1] Pseudonyms are used to protect the identity of the participants.

administrators as exemplary technology users. Technical and pedagogical support personnel who participated were either full-time employees or graduate assistants whose duties involved supporting students and teachers with technology use for instruction. An overview of the participants' background information is presented in Table 2.

Table 2
Background information about the participants

Role	**Participant**	**Gender**	**Highest Degree Received**	**Program**	**Years of Experience in the position**
Administrators	Mike	Male	PhD	WLC	4 years
	Erica	Female	PhD	ITA	2 year
	Bethany	Female	PhD	IEP	8 years
Technical and pedagogical support personnel	Samantha	Female	MA	WLC	1 year
	Adam	Male	MA	IEP/ITA	2 years
	Dave	Male	MA	IEP	3 years
Teachers	Susan*	Female	PhD	WLC	6 years
	Kate*	Female	PhD	WLC	4 years
	Randi*	Female	PhD	WLC	17 years
	Kyle	Male	PhD	WLC	15 years
	Jade*	Male	MA	ITA	5 years
	Ally*	Female	PhD	ITA	9 years
	Sally	Female	MA	ITA	19 years
	Sammy*	Female	MA	IEP	4 years

* Exemplary technology-using teachers nominated by the administrators

Administrators

Three administrators took part in this study: the department chair of WLC, the program coordinator of the ITA program, and the program director of IEP, each of whom will be introduced in the next section.

Mike

Mike is the WLC department chair and a professor of German and has been in this position since 2008. He was teaching *German for Business and Professions* at the time of data collection, and he also occasionally teaches Germany Today and German Film and Media Studies. In addition, he co-teaches a hybrid course, *Technology, Globalization and Culture*, that is available online through Engineering Online Education. His research interests involve cultural studies, communications, media, museum studies, cultural politics, and politics of art and culture. As the chair, he has administrative responsibilities for the department and in all areas of departmental activity. He defines his role as:

> teaching in the department, encouraging faculty research, faculty management and supervision, mentoring, developing faculty programs, being forward-looking in terms of the direction of the department, collaborating on a shared vision for the department, working closely with faculty, but also working closely with other units on campus. (Interview, p. 1)

Mike provides feedback in the content of annual evaluations for both tenure track and post-tenure faculty. He also facilitates communication between teachers and other administrative units and informs teachers about any resources of which they may or may not be aware. For example, part of his job is to identify grant opportunities for faculty who may want to pursue them or he may assume a leadership role in those grant activities himself.

He comments that technology is unavoidable and here to stay and argues that it is most efficient when combined with an effective teaching approach to reach specific course objectives rather than using it just for the sake of using technology. He stated that faculty engagement in technology use is a spectrum, ranging from those who make extensive use of technology, to those who are moderate users, and some faculty who use less technology. However, almost all faculty members use some form of technology in their classes, ranging from placing course materials on learning management systems to holding classes in a technology-enriched classroom.

Erica

Erica is the ITA program coordinator since 2009, and she holds a doctoral degree in Applied Linguistics and Technology. Her primary responsibility in the ITA program is to provide the assessment to all incoming ITAs. She works with ITAs on duty who need to improve their oral communication skills; administers the tests at the beginning and end of every semester, hires and trains test raters; develops test items and reports the test scores both to students and the departments. She also provides support for teachers in terms of scheduling classes in media equipped rooms and provides resources such as laptops for checkout, pinnacle devices for video recording, and purchases licenses for different kinds of software.

Erica believes that technology plays a central role in teaching languages as “it just makes life much easier in terms of achieving certain teaching goals” (Interview, p. 6). She stated that all teachers in the program used technology for teaching purposes although some did more so than others.

Bethany

Bethany, the director of IEP since 2004, is also a professor in the English department, in the area of Teaching English as Second Language/Applied Linguistics (TESL/AL). She teaches some Linguistics courses like Introduction to Linguistic Analysis, Sociolinguistics and Women, Men and Language. Her research interests involve Pragmatics, Cross-cultural Pragmatics, and Speech Acts.

Upon becoming the IEP director, Bethany had several priorities. These included: (1) developing a set of research-based learner outcomes to complement the program's curriculum goals and then developing a set of program-wide set of assessment measures for those learner outcomes, (2) implementing more efficient record-keeping procedures for the program, and (3) ensuring that the IEP's teaching continue to be of the highest quality. This last goal involved providing professional development opportunities for instructors to learn about and implement innovative teaching techniques, especially with regard to technology. She wanted to establish close ties with the TESL/AL program so that there would be synergy between IEP's instructional technology activities and the TESL/AL's program focus on computer-assisted language learning. Bethany believes that technology has a great potential for language teaching.

Technical and Pedagogical Support Personnel

Three technical and pedagogical support personnel were involved in this study: the LSRC director, the instructional technology coordinator in the English department and the language lab coordinator in IEP. Each technical and pedagogical support personnel will be introduced next.

Samantha

Samantha, the LSRC director, can be classified both as an administrator and as technical and pedagogical support personnel because s/he is supposed to run the center as well as help teachers integrate technology into their classrooms. Samantha started her position in August 2011, and is finishing up her PhD in Instructional Technology with a focus on CALL. She has a master's degree in Applied Linguistics and a bachelor's degree in Foreign Language Education, Spanish and Linguistics.

She defines her main role as the LSRC director as one in which she is helping teachers integrate technology into the language classroom and collaborating with them in developing projects to better implement technology. She also tries to find new ways to use technologies in the classroom.

Adam

Adam is the instructional technology coordinator in the English department. He is a doctoral student in Rhetoric and Communication Program; both his master's and bachelor's degrees are in English Literature. In addition to his responsibilities as the instructional technology coordinator, he teaches college composition courses. The instructional technology coordinator position is a one quarter-time graduate student position. Although the position is officially titled as "instructional technology coordinator," it is known more as a *"*Moodle administrator*."* The department has another Information Technology Specialist who maintains and updates the hardware. The Moodle administrator has more one-on-one interaction with teachers in implementing Moodle for instruction. That is why he was included in this study.

As the instructional technology coordinator in the English department, Adam's duties include supporting teachers and students using Moodle. He sets up the courses for teachers and helps them solve any problems they may encounter. He also holds three workshops per semester to teach teachers how to use specific tools within Moodle (e.g. Gradebook, how to link to webpages, and how to set up discussion forums). In addition, he provides one-on-one help and training for teachers during his set office hours, or by appointment.

Dave

Dave is the language lab coordinator in IEP and a graduate student pursuing a doctoral degree in Applied Linguistics and Technology. He has been working at the university for six years but has been the language lab coordinator for three years. He has a master's degree in TEFL/TESL, a certificate and a diploma in English Language Teaching to Adults. He has experience as a classroom teacher and teacher trainer in different parts of the world such as Namibia, South Korea and Sri Lanka.

As the IEP language lab coordinator, he is responsible for making sure computers are functional, the room is clean, and the equipment is working properly (e.g. headsets, printers). He developed an e-learning site for both student and teacher use. Students can access TOEFL (Test of English as a Foreign Language) preparation materials (e.g. audio files) and links to other sources using this e-learning site and teachers can use the e-learning site as a mini course management system where they can post assignments, syllabus, and other materials. They also use it to book resources and equipment. Another project for which he provides support to teachers is an online flashcard tool

used in reading classes. He helps teachers and students set up accounts and use the software and teaches them how to interpret scores. He also occasionally addresses technical issues that teachers encounter while using the program.

Teachers

Eight teachers (four from WLC, three from ITA, and one from the IEP) participated in this study. Six teachers were nominated as exemplary technology users by their administrators while two (one from WLC and one from ITA) were considered to be using technology to a lesser extent. Each teacher participant will be introduced below.

Susan

Susan is an assistant professor of French and has been working at this university for 6 years. Her typical course load is between four and five classes each year. Her doctoral degree is in French; however, she did point out that her PhD program was very strong in second language acquisition and she had a strong background in teaching, teacher training, and language training in the classroom as well as curriculum development. Although her main research area is in French Cinema, she is also interested in curriculum design. She has not received any formal CALL or technology-related training throughout her studies; however, she self-edifies by reading the works of leaders in the CALL area and CALL related journals.

Susan rates herself as a “heavy” technology user both in her personal and professional life. She uses e-mail, texting, MS Office, Internet, online sources, online dictionaries, and different sorts of language sites, and troubleshoots one her own when

faced with technical issues. She opines that technology is a necessity and she cannot live without it on a personal level.

Kate

Kate is an assistant professor of Spanish and has been working at the university for four years. She has a PhD in Applied Linguistics and Linguistics in Spanish. She has a master's degree in Foreign Languages and Cultures with a specialization in Spanish and a bachelor's degree in Translation and Interpretation. She teaches Spanish Conversation and Spanish for Professions. She also coordinates the 100- and 200-level courses for Spanish that are usually taught by teaching assistants who may not have any teaching experience at all.

Kate has taken technology-related courses during her doctoral studies and focused on computer-assisted language testing in her dissertation. She was also involved in developing hybrid and online courses during her graduate studies and initiated the first hybrid Spanish course at the university.

If she were rating herself on a 5-point scale, Kate would give herself a 3 out of 5 in terms of technology proficiency. She uses technology a lot, but sometimes she does not know how things work and does not want to spend time on learning. If she can have someone else do it, she would rather spend that time on something else. The technologies she uses in her personal life include the iPhone, a laptop, and social networking (i.e. Skype, Messenger, Second Life). For professional purposes, Susan uses MS Office programs, statistical analysis software, and audio editing tools such as Audacity.

Randi

Randi is an associate professor that has been working at this university for almost ten years. She has a total of seventeen years of teaching experience. She has a doctoral degree in literature, and this is also her research focus. In her graduate studies, she took a semester-long course on how to teach and she has experience in pedagogy and language teaching. However, she has not received any formal training in technology. Randi taught EFL for several years and she indicated that her pedagogical knowledge improved during that time.

She categorizes herself as "mid-tech" as she does not do web design or super animated presentations, but uses technology to meet her pedagogical needs. In her personal life, she uses a computer and a smart phone. She stated that she could not afford to buy many different kinds of tools with limited capabilities, so she is waiting for the one with all the features she needs. If a tool were used just for one purpose (e.g. e-book reader), she would probably not buy it

Kyle

Kyle is an associate professor of German Studies and holds an affiliate appointment with the Women's and Gender Studies program. His research work is primarily historically oriented about how social status was generated in the German World in the late 1900s and early 20th centuries. He studied Economics in his undergraduate education but decided that he was more interested in humanities and continued with History and German Studies. He also studied in Germany several different times.

During his graduate studies in German, Kyle took courses in second language acquisition and language pedagogy. Yet, he has not had any formal training in technology use or integration. He has been teaching German for seventeen years and during the time of this study he was teaching a 300-level *German Conversation* class.

In terms of technology use, he uses main technologies such as e-mail and MS Office programs but he considers himself as a "late adopter" of media technologies. He stated that his cell phone was not a smart one. He prefers to read paper newspapers as opposed to online versions as he can quickly scan the text and read items that look interesting to him that he would otherwise never click on if it were on a webpage. Similarly, he does not prefer to use tablet PCs, iPads, or electronic readers because they limit his random access to text and complicate his ability to annotate. He does not use course management systems for grading because he cannot provide feedback within the text.

Jade

Jade is a doctoral student in Applied Linguistics and Technology and has been teaching ESL courses at the university for over five years, including Speaking, Reading, Writing and Listening. His master's degree focused on CALL. Jade's native language is Chinese and he started teaching EFL in China in 2002. During the time of this study he was teaching a section of *Communication Skills for International Teaching Assistants.* In addition to his teaching responsibilities, he assists the ITA coordinator and works on test development, test validation and conducts research on the reliability and validity of the oral proficiency test administered by the program to incoming TAs and TAs on duty.

Because his degree is directly related to technology, Jade has taken quite a few technology related courses and classes that explain how technology can be used to teach languages. Jade considers himself an "advanced" technology user because he learns software programs very quickly. He uses a lot of technologies both in his personal and professional life such as statistical packages, streaming audio, streaming videos, pinnacle devices, and pronunciation software. He believes that technology reduces a teacher's load by providing opportunities for students to use software for exercises that require repetition and individualized instruction and saves classroom time for more collaborative activities.

Ally

Ally is a lecturer in the ITA program and was teaching two sections of *Communication Skills for International Teaching Assistants* during this study. She has been teaching ESL courses at the university since 2003. Ally has a PhD in Applied Linguistics and Technology and a master's degree in Teaching English as a Second Language. Thus, Ally has received formal training in CALL and how to integrate technology into language teaching and testing.

She considers herself as a "proficient" technology user. Although there are probably a lot of things that she does not know, Ally feels like she can easily figure it out on her own. She uses her computer and her smart phone in both her personal and professional life. Ally believes that technology plays a significant role in her teaching. Instead of using a commercial textbook, Ally uses a course management system where

she posts online materials and uses the tools within the course management system for class activities and assignments.

Sally

Sally is a lecturer in the ITA program and has a master's degree in English. She started teaching ESL courses in 1983 and took some additional graduate work in the Applied Linguistics program. She has not received any formal training in technology integration except for sitting in as a guest in the Computer Methods for Applied Linguistics class during a semester.

Sally has taught different levels of ESL writing, ITA courses, *Introduction to Linguistics*, and first year composition for native speakers. In addition, Sally taught a pro-seminar for incoming teaching assistants where she team-taught composition pedagogy. During the time of this study, she was teaching a section of *Communication Skills for International Teaching Assistants* and *Academic English* for international graduate students and the pro-seminar. She also has experience in teaching EFL in Mexico and Chile.

Sally considers herself "medium" in terms of technology proficiency since she can perform typical tasks that she needs, but does not have advanced skills like programming. She uses e-mail to communicate, the Internet for research and teaching, videos to show in the class, cameras to record student performances, course management systems to upload materials, and PowerPoint presentations to deliver content. She opines that technology does not play a central role in her teaching and argues that pedagogy should drive technology not vice versa.

Sammy

Sammy has been a lecturer in the IEP program for two years. Prior to that she taught in China for a year and in Mexico for six months. She has a master's degree in Linguistics with a specialization in teaching ESL. During the time of this study, she was teaching Oral Communication and Reading and Writing in the IEP. In addition to her teaching responsibilities, she was the writing coordinator that included the duties of organizing meetings with other writing teachers, choosing textbooks, and working on learner outcomes for writing.

Sammy considers herself "good with technology". She uses e-mail, chats and forums for both personal and professional purposes. For example, she uses the chat function in Facebook to talk to her friends, and uses the chat function in Moodle to take attendance and give directions during online lab days. Sammy thinks that technology is extremely useful in keeping her connected to her friends and family, as well as for motivating students to take responsibility for their own learning while teaching.

Overall, eight teachers participated in this study. They had a wide range of experience in teaching and technology use. Having introduced the participants, the discussion now turns to data collection techniques and materials.

Data Collection Techniques and Materials

In this study, the two main sources of evidence were interviews and observations. Interviews conducted with administrators, teachers, and technical and pedagogical support personnel resulted in 5 hours and 42 minutes of audio recording and 194 pages of transcription. A typical course was observed for five teachers using an

adapted version of the ISTE (International Society for Technology in Education) Classroom Observation Tool. The other data sources included field observations and artifacts that documented teachers' practices. Each of the data collection techniques will be explained next.

Interviews

Three administrators, eight teachers, and three technical and pedagogical support personnel were each interviewed once, for a total of fourteen interviews in the study. All interviews were semi-structured and used the same questions for each category of participants so as to be able to have a comparison among the cases. However, additional questions were included based on participant responses. The interview protocols, which can be found in Appendix B, were prepared based on the factors identified in the literature and the theoretical framework. The interview protocol helped to maintain a systematic coverage of the phenomenon while allowing for probing into any emerging new issue (Dornyei, 2007). All interviews were audio recorded and later transcribed.

The questions for administrators were divided into five categories: 1) background; 2) administrative roles; 3) departmental facilities; 4) teacher-administrator relationship; and 5) technology (attitudes, personal use, and departmental use). The questions for technical and pedagogical support personnel included information about 1) background; 2) facilities and resources available for students and teachers; and 3) the type of help they provide teachers.

The interview protocols for teachers were prepared based on the factors identified in the literature. For example, time was found to be a factor impacting teachers' technology use and integration, so teachers were asked how much time they spent on preparing for their classes and whether technology reduced or increased that preparation time. Pedagogical beliefs were found to be another significant factor determining teachers' technology use and integration. Thus questions about language teaching philosophies and beliefs about the role of technology in language teaching were included.

Questions for those teachers who were nominated as exemplary technology users and whose technology use was more limited were only slightly different. Both protocols included questions about: 1) background (i.e. education, experience, teaching and research interests, training in technology or CALL); 2) general information about teaching (language and skill are they are teaching, number of students in a class, teaching load); and 3) teaching philosophy (the best methods to teach a language, the role of technology, how they decide what students need to know). Additionally, exemplary technology-using teachers were asked about their technology use and reasons behind it, how they learn about different technologies, and support systems they have available for technology integration.

Classroom Observations

To get a general sense of how teachers managed their classrooms, the researcher observed a typical classroom of five different teachers. Two teachers, both of whom were identified as limited technology users, were excluded from the observations

for one did not teach a language class during that semester, and the other did not teach the same class she did during the semester of interviews. The observations were conducted the semester after the interview data collected because of scheduling issues.

An adapted version of the ISTE Classroom Tool (ISTE, 2008) was used to document observations (See Appendix C). The original ISTE classroom observation tool (ICOT) was developed to guide classroom observations in technology integration by staff and consultants in the Education Leadership Department at the International Society for Technology in Education. ICOT focuses on classroom setting, student characteristics, technology use by teacher and students, teacher and student roles, and evidence of meeting the *National Educational Technology Standards* for teachers (NETS-T) (ISTE, 2008).

The adapted observation tool used in this study included most of the items in ICOT, but it was slightly modified to make it more flexible and applicable in a university-level language setting. For example, calculators or science probes would not be typically used for language instruction. Therefore, the section about the technologies was converted to an open-ended format to capture the kinds of technologies used, instead of a list from which to choose. Also, the part about NETS-T was excluded because it was not the focus of this study.

The classroom observation tool used in this study focused on setting, room description and student characteristics, student groupings, teacher roles, learning activities, how essential the technology was to the teaching and learning activities, and technologies used by the teacher and students. The observation tool also included a

three-minute chart that allowed making a note of the technology used by students and teacher and whether that technology was used for teaching and learning as opposed to recreation or routine tasks.

In addition, during the observations the researcher took descriptive and reflective notes about the setting and practices of the teacher and students as well as notes about questions that she wanted to ask the teacher in a subsequent informal conversation. The observations were not audio/video taped because that level of detail was not necessary for this study, but hand-written notes were taken and later typed.

Field Observations

Unstructured field observations were conducted in the Language Studies Resource Center to see how teachers and students utilized the services provided by the center. The researcher assumed a complete observer stance since it was a public setting (Merriam, 2009). During the observations, notes about the physical setting, the activities, and the behaviors of key stakeholders (students, student assistants, teachers) were taken. The researcher also took reflective notes about "feelings, reactions, hunches, initial interpretations, speculations and working hypotheses" as suggested by Merriam (2009, p. 131).

Research Procedures

This section introduces the information about the procedures that were followed prior to and during data collection. This includes description of the participant selection, the interview process, classroom observations, and the field observation. The study was conducted over two semesters. The interviews were conducted in Fall 2011, while the

classroom observations were conducted in Spring 2012, and the field observations were conducted in Fall 2011. Table 3 gives a chronological overview of the data collection procedure. Next, the participant selection procedure is described.

Participant Selection

According to Merriam (2009), probability and nonprobability sampling are the two basic types of sampling. Probability sampling is used in quantitative research to generalize findings to a population. Nonprobability sampling is more appropriate for qualitative research because generalization to a population is not a goal in qualitative studies. The most common form of nonprobability sampling is purposeful sampling, which is "based on the assumption that the

Table 3.
Overview of research procedures

Participant	Date	Data collection method	Duration
Mike	Sep 2, 2011	Interview	48:26 min
Adam	Sep 7, 2011	Interview	22:41 min
Bethany	Sep 8, 2011	Interview	67:05 min
Dave	Sep 9, 2011	Interview	20:57 min
Susan	Sep 12, 2011	Interview	50:22 min
Samantha	Sep 13, 2011	Interview	35:02 min
Sammy	Sep 16, 2011	Interview	37:50 min
Kyle	Sep 26, 2011	Interview	63:42 min
Sally	Sep 26, 2011	Interview	33:33 min
Kate	Sep 29, 2011	Interview	69:26 min
Ally	Sep 29, 2011	Interview	28:58 min
Jade	Oct 7, 2011	Interview	42:27 min
Randi	Oct 14, 2011	Interview	66:66 min
Erica	Oct 17, 2011	Interview	32:23 min
Kate	March 20, 2012	Classroom Observation	90 min
Ally	March 22, 2012	Classroom Observation	90 min
Randi	March 26, 2012	Classroom Observation	50 min
Jade	March 27, 2012	Classroom Observation	90 min
Susan	April 19, 2012	Classroom Observation	90 min
LSRC	Oct 22-23, 2012	Field Observation	180 min

investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned" (Merriam, 2009, p. 77) A purposeful sampling is used in this study to identify the "people that can best inform the research about the research problems under examination" (Creswell, 2007, p. 118).

Case studies usually include two levels of purposeful sampling. First, the researcher identifies the case to be investigated. Then, a second level of sampling within the case is done to identify the key informants (Merriam, 2009). In this study, three levels of sampling were employed. First, the case is defined: language teaching at the university level. The overarching goal of this study was to identify the factors impacting language teachers' technology use; investigating a technology-rich university setting might help focus on issues other than the availability of infrastructure and technology resources. In the second level, all the units of analysis representing the case—WLC, ITA, IEP, and the ESL program—were invited to participate in the study. Because the ESL program did not respond to the invitation to participate in the study, the other three units of analysis were included in the study.

Finally, the participants were selected in each unit of analysis. The administrators and the technical and pedagogical support personnel were the only representatives of their units. However, the teachers were carefully chosen based on a selection criterion. As the purpose of the study was to identify both the factors contributing to successful technology integration and the barriers inhibiting technology use, it was important to include teachers at two different sides of the technology-use spectrum. A chain sampling strategy—a form of purposeful sampling that involves locating a few key

participants who can refer the researcher other participants—was used to identify the teacher participants. The administrators were asked to nominate two teachers who were exemplary technology users because of their high level of technology use, as well as two teachers whose technology use was limited.

All three administrators had difficulty in nominating teachers who used technology to a lesser extent, as they believed all the teachers had used technology in one way or another. For instance, the IEP was using Moodle to track student attendance, so they were obliged to use that piece of technology even if they did not use anything else. Most of the teachers in all three programs used a course management system either to post materials online or used the more innovative tools within the system. Thus, the WLC department chair was able to nominate only one teacher who did not use much technology in his classroom, in addition to three exemplary technology users. The ITA program coordinator nominated two teachers who used more conventional technologies as opposed to the two exemplary teachers who used more innovative tools in their teaching. One of the teachers nominated as a limited technology user did not respond to the email invitation to participate in this study. The IEP director was able to nominate two exemplary technology users and one limited technology user. Only one teacher from IEP who used technology in exemplary ways chose to participate in the study.

Data Collection Procedure

Interviews and classroom observations were the two main sources of data in this study. In addition, an unstructured field observation was conducted in the Language Studies Resource Center to observe how teachers and students utilized the center.

Each participant was interviewed individually and the interviews took between 22 and 70 minutes. More detailed information about the interviews can be seen in Table 4. Creswell (2003) recommends that qualitative research be conducted in the natural setting and "this enables the researcher to develop a level of detail about the individual or place and to be highly involved in actual experiences of the participants" (p. 181). The interviews for this study were also conducted in the participants' offices, which allowed observing their environment and collecting additional data that might be helpful for this study. For example, the IEP teacher was sharing a big office with a few other colleagues, enabling them to converse about their classroom practices. One of the teachers in WLC had a poster on her wall that she presented at a conference earlier that was about elaborated input and multimedia glosses in teaching reading. The interview with the IEP language lab coordinator was also conducted in the language lab where I could see what kind of resources they had available. Additionally, I asked the LSRC director to give me a tour of the center during which she explained the resources they had available as well as how different sections of the center were used by teachers and students. All the interviews were audio recorded, transcribed and later coded. At the end of the interviews, the teachers were asked to add the researcher to their course websites—if they used any.

Classroom observations were conducted in Spring 2012 and were guided by an observation tool. The researcher observed one typical classroom of five teachers to see their average classroom practices and what role technology played in their teaching. In addition to the observation tool, descriptive and reflective notes were taken and typed later. Right after the classroom observations, informal meetings with the teachers were held to clarify issues or answer the questions the researcher might have.

For the field observation in the Language Studies Resource Center a week in the middle of the fall 2012 semester was carefully chosen. The field observation was not conducted very early in the semester based on the assumption that students would not be familiar enough with the services provided at the center or they might not have any projects to work on yet. Similarly, the end of semester students could be too busy with final exams or could have already finished with their projects that might have required using the resources provided through LSRC. This unstructured observation provided additional data about the resources available to teachers and students and how the center was utilized. Now, the researcher's role and the strategies employed to ensure the validity of the findings will be discussed.

The Researcher's Role

Qualitative research is interpretive in nature, which means, "the researcher filters data through a personal lens that is situated in a specific sociopolitical and historical moment"(Merriam, 2009, p. 182). Because personal interpretation brought to qualitative data analysis is inevitable, biases, values and personal interests that the researcher brings need to be explicitly stated. In this regard, Creswell (2003)

recommends five main strategies: 1) including statements about past experiences; 2) commenting on connections between the researchers and the participants; 3) indicating steps taken to obtain permission from the Institutional Review Board; 4) discussing steps taken to gain entry to the setting; and 5) commenting about sensitive ethical issues.

As a researcher and doctoral student in Curriculum and Instructional Technology with a minor in Applied Linguistics and Technology, I aimed to investigate the factors impacting university-level language teachers' technology use in their teaching. Prior to this study I had taught in IEP for one semester but I was not teaching during the semesters that data were collected for this study. Having an MA degree in Teaching English as a Second Language (TESL) program and having taught in IEP, I already knew some of the participants when I approached them to be part of the study. Some teachers were my fellow graduate students and I had been familiar with their research and teaching interests. However, as I was not directly involved in teaching in any of the three settings during the time of this study, I was an outsider for participants in terms of their teaching contexts.

My background in technology might raise a concern about how participants answered my questions. Knowing that I am interested in technology, they might respond in socially acceptable ways, which might be using technology for instructional purposes in this case. I developed a rapport with participants to ensure that they felt comfortable sharing their experiences and opinions without feeling pressured. I also explicitly stated that there were no right or wrong answers to the questions that their

insights would contribute to the existing research base. Furthermore, to avoid any conflict between the teachers and administrators, teachers who were nominated as using technology to a lesser extent were not informed that their names were given by their administrators as limited technology users.

This study was reviewed and approved by the Institutional Review Board at the university and exempted on the grounds that data collection would be conducted as it was explained in the application form. I had the participants sign the consent forms, which included information about the purpose of the study, why the participants were invited to take part in this study, and what they would be asked to do as informants in this study (See Appendix D)

Ensuring Quality of Research Findings

To ensure the validity of findings in a qualitative study, Creswell (2003) recommends eight primary strategies: 1) triangulating the data sources; 2) member-checking; 3) providing rich and thick description; 4) clarifying the bias the researcher might bring to the study; 5) presenting negative and discrepant information; 6) spending prolonged time in the field; 7) using peer debriefing; and 8) using an external auditor to review the entire project. Using one or more of these strategies to check the accuracy of the findings will help determine whether the findings are accurate from the standpoint of the researcher, the participant, or the reader (Creswell & Miller, 2000).

Five strategies were employed in this study to ensure the accuracy of findings and interpretations: 1) triangulating the data sources; 2) member-checking; 3) peer debriefing; 4) providing thick descriptions; and 5) clarifying researcher bias. First, I used

multiple methods of data collection to triangulate findings, so I compared results from interviews, classroom observations, and field observations. I also invited participants with different roles and duties —administrators, technical and pedagogical support personnel, and teachers—to shed light on the same phenomenon. Comparing themes across different sources of data enabled me to strengthen the validity of the study (Yin, 2008).

Second, I did member checking to make sure that my interpretations were accurate representations of what the participants said and did. For this, I created a document for each participant that included excerpts from the interview transcriptions that I used in the dissertation. I emailed those documents to the participants and asked for feedback and revisions if necessary. Of the fourteen participants, five did some revisions, five approved the interpretations and quotes as they were, and four did not respond to the email. Feedback received from the participants was taken into consideration in order to interpret the findings.

Third, I used a peer-debriefing technique to enhance the accuracy of the findings and interpretations. I showed my data set and conclusions to a graduate student who was working on her doctoral degree in Applied Linguistics and Technology with a minor in Instructional Technology. My peer was familiar with the setting and some of the participants, as she had taught both in IEP and the ESL program for four years. She reviewed the study and asked questions about it. This peer debriefing helped me see if the phenomenon under study resonated with people other than myself (Creswell, 2003).

Fourth, I tried to provide rich and thick descriptions both in methodology and in the results section, in hopes to transport readers to the research setting. Finally, all participants were informed about the purpose of the study, the data collection methods, and how the results will be used. This helped me clarify both my intentions as a researcher and their rights as participants. On occasion, special requests made by the participants were graciously taken and I ensured that their input was included the way they wanted it to be.

Data Analysis

This section describes the data analysis procedure that was followed to answer the research questions. Table 4 provides an overview of data sources used and is divided into two source categories: primary (main source for obtaining data for a research question) and secondary (source used to check for additional evidence for the same research question). For example, classroom observations are a primary data source in research question 1 and secondary in research question 2. All data were coded by the researcher.

According to Merriam (2009), the preferred way to analyze qualitative data is the one that occurs simultaneously with data collection. She further argues, “Data that have been analyzed while being collected are both parsimonious and illuminating” (p. 171). Following this recommendation, the analysis in this study started while data collection was still under way. The researcher made notes of the reflections, tentative themes, ideas and things to pursue while collecting data, which informed the upcoming data collection sessions. The first step in the analysis included creating a *case database*

where all the data from different sources (i.e. interviews, observations) were collected

where all the data from different sources (i.e. interviews, observations) were collected

in one place as suggested by Yin (2003). The analysis followed the qualitative data analysis guidelines and the coding procedures outlined in Ritchie, Spencer and O'Connor (2003).

Table 4
Data sources used the answer research questions

Research Question	**Primary Source**	**Secondary Source**
1. What are the ecosystem-level factors impacting university-level language teachers' technology use or non-use?	• Teacher Interviews • Administrator Interviews • Technical and pedagogical support personnel Interviews	• Field Observation • Classroom Observations • Post-Observation Notes
2. What are the teacher-level factors that impact university-level language teachers' technology use or non-use?	• Teacher Interviews	• Classroom Observations • Post-Observation Notes
3. How does teacher-ecosystem interaction impact university-level language teachers' technology use or non-use?	• Teacher Interviews • Administrator Interviews • Technical and pedagogical support personnel Interviews	• Classroom Observations • Field Observation • Post-Observation Notes

The qualitative analytic process is cyclical and iterative rather than linear (Saldana, 2009; Spencer, Ritchie, & O'Connor, 2003). Ritchie et al. (2003) propose using an *analytic hierarchy* to make sense of qualitative data, which Spencer et al. (2003) define as a hierarchy that is "made up of a series of 'viewing' platforms, each of which involves different analytical tasks" (p. 213). In Figure 5, Spencer et al. (2003) describes this cyclical process and uses ladders as an analogy for the ability to move up and down

which enable researchers to move ahead to the next stage of analysis while still allowing to "look down on what is emerging and reflect on how much sense [it] is making in terms of representing the original material" (p. 213). The analytic process used for data analysis in this study included three forms of activity: data management, descriptive accounts, and explanatory accounts. Data management was the process in which the raw data were reviewed, labeled, sorted, and synthesized. In descriptive accounts,

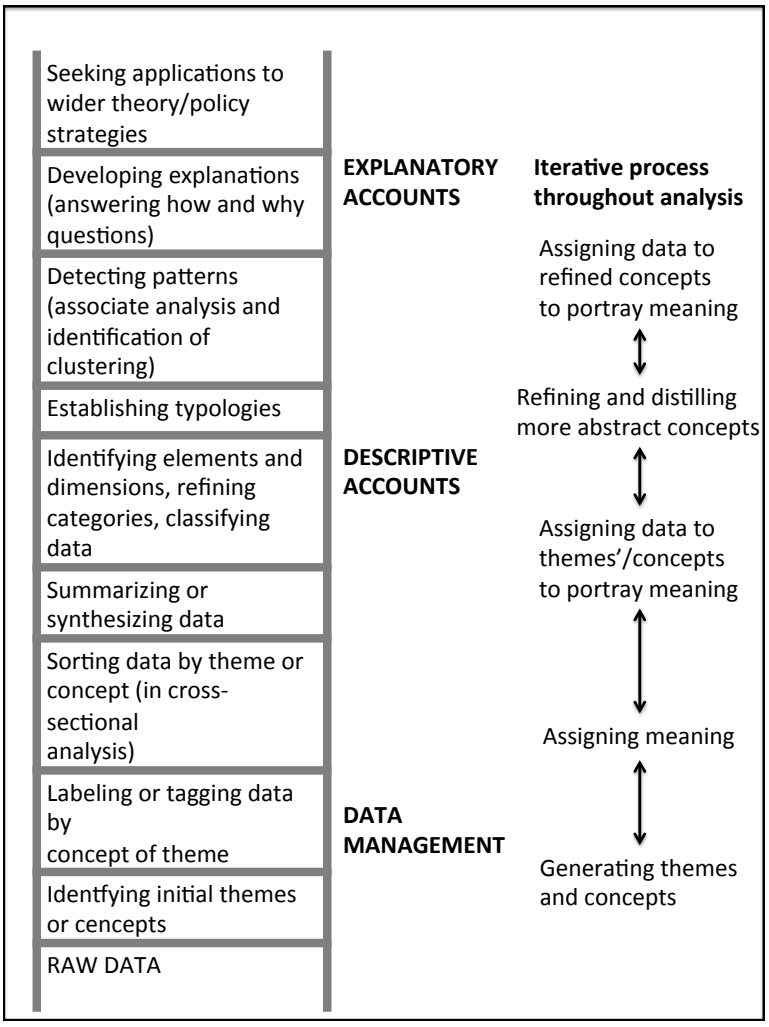

Figure 5. The analytic hierarchy: a depiction of the stages and processes involved in qualitative analysis (Spencer et al., 2003, p. 212)

key dimensions were identified and the data ordered earlier were further classified and typologies were established. In explanatory accounts, explanations of the identified patterns were established. Following is a more detailed explanation of each step in this analytic hierarchy.

Data Management

Data management was carried out using Transana™, which is an open source computer-assisted qualitative data analysis software. This software allows researchers to analyze digital video or audio data. Transana™ has features such as transcribing, organizing video/audio clips, and assigning analytic key words to these clips (Woods, 2012). With these features Transana™ can be classified as a "code and retrieve program [because it allows researchers] to label or 'tag' passages of text that can later be retrieved according the codes applied" (Spencer et al., 2003, p. 206). These features proved to be very useful in managing the data for this study. Next, the four steps taken to manage the data will be described: 1) identifying initial themes or concepts; 2) labeling or tagging data; 3) sorting the data by theme or concept; and 4) summarizing or synthesizing the data.

The first step in the data analysis was *identifying initial themes or concepts* that started with the familiarization process. The data analysis started by reading through all the data to get a general sense of the information and to reflect on its overall meaning during which the researcher started recording general thoughts about the data. Then the researcher selected two interviews (one exemplary teacher and one limited technology user) and went through the interviews for more detail. This familiarization

process resulted in a long list of possible themes and concepts. The next task was then to devise an 'index' drawing upon recurrent themes and issues. The indices created for administrators, teachers, and technical support personnel who participated in this study can be seen in Appendix E.

Having constructed an initial index, the next task was *labeling or tagging* the complete dataset, which Ritchie et al. (2003) refers to as 'indexing'. Therefore, indexing in this study involved two steps. First, the researcher read each phrase, sentence, and paragraph in greater detail. Then decisions were made about which part or parts of the index would apply to each segment. Labeling at this stage was only intended as a first step in sorting the data for later retrieval. In the later stages, the categories were refined that resulted in adding new categories or combining conceptually similar categories together.

The next step included *sorting the data by theme or concept* and locating similar content and properties together. This allowed the researcher to focus on each theme in greater details. Transana™ actually creates a collection report that brings together all the segments indexed under the same category without losing the context or the location of specific segments. For example, all the segments that were categorized under "support" could be combined together to see how different participants referred to issues of support. An example of this data-sorting phase can be seen in Appendix F.

The final stage of data management was *summarizing and synthesizing the original data.* The synthesis at this phase helped the researcher to reduce the amount of material to a more manageable level. It was also a crucial task for making sense of how

each word of the raw data was relevant to the topic under investigation. This synthesis was built upon the collection reports in Transana™ that provided all the segments categorized under the same theme without losing content or context. The second stage in the analytic process, descriptive accounts, will be described.

Descriptive Accounts

In descriptive analysis the main task was to generate descriptions that were conceptually pure in order to make meaningful distinctions and to display content that was illuminating (Ritchie et al., 2003). This involved three key steps: detection, categorization, and classification.

Detection involved analyzing a theme in-depth across all cases in the study and then identifying the range of statements that have been labeled or tagged as part of that theme. Next, the key dimensions within the range were further examined to identify broader and more refined categories. Data were then assigned to the new categories. The next task was then to classify the groups of categories at a higher level of abstraction. It was at this stage where the main factors impacting university-level language teachers' technology use and integration were identified through condensing data into more manageable and meaningful chunks. The final stage at the descriptive accounts is establishing typologies (Ritchie et al., 2003).

According to Ritchie et al. (2003), typologies have two important characteristics. First, they are usually multi-factorial classifications. This means they are combinations of multiple dimensions that provide a more refined portrayal. Second, the categories are discrete and independent from each other. In this study, predefined typologies that

were established (prior to this study) were used (Ritchie et al., 2003). In fact, the two typologies—exemplary technology users and limited technology users— were used as a criterion in participant selection.

Explanatory Accounts

The last step in the data analysis was the explanatory accounts, which included finding patterns of association within the data and attempting to explain why those patterns occurred. These explanations were based on the concepts of ecological perspective and the findings from earlier studies that examined factors impacting teachers' technology use and integration. Therefore, the factors identified in the study were classified into three main categories: ecosystem-level factors, teacher-level factors, and teacher-ecosystem interaction.

To sum, the analytic process in this study included a cyclical process with three main steps of analytic hierarchy—data management, descriptive accounts, and explanatory accounts proposed by Spencer et al. (2003). Data management was the process during which the raw data were reviewed, labeled, sorted, and synthesized. In descriptive accounts, key dimensions were identified and the data ordered earlier were further classified and typologies were established. In explanatory accounts, explanations of the identified patterns were established.

Chapter Summary

This chapter outlined the case study methodology used and the selection of a single case study design with three embedded units. Then, the research context was described and each participant was introduced. In addition, data collection techniques

and materials were described. Research procedures including participant selection, data collection procedures, the researcher's role, and the steps taken to ensure the quality of research findings, were all explained. In the final section, the steps taken to analyze the data were described. In the next chapter, the findings from the data analysis will be presented to answer the research questions.

Chapter 4: RESULTS

This chapter presents the results concerning the factors impacting university-level language teachers' technology use and integration. While this was accomplished through qualitative data sources that were described in greater detail in chapter three, the results that will be presented here are in relationship to the research questions introduced in chapter one. Major findings and a summary of the results will also be reported.

To begin, the results of the first research question are introduced. Through examination of teacher interviews, classroom observations and post-observation notes it was concluded that teacher-level factors impacting university-level language teachers' technology use were the teachers' *beliefs about the role of technology, daily technology use, technical skills, training in technology*, and *professional/research interests.*

Following this, the results of the second research question are presented. The description of the eco-system level of factors is presented based on the factors identified in the study. Data sources include semi-structured interviews with teachers, administrators and technical and pedagogical support personnel; field observations; classroom observations; and post-observation notes. The findings indicated that ecosystem-level factors impacting the technology use of university-level language teachers were *access to technology*, *funding opportunities*, *administrative support*, and *professional development*.

Finally, the results of the third research question are given. Teacher-ecosystem interaction was studied through semi-structured interviews with teachers,

administrators and technical and pedagogical support personnel, as well as through field observations; classroom observations; and post-observation notes. The results indicated that *student characteristics*, *peer interaction, technical support*, and *inter-departmental collaboration* contributed to successful technology use in a university-level language teaching environment.

A brief summary of the information about the participants referred to throughout the chapter is provided in Table 5. More detailed information about each participant can be found in chapter 3. Following is a description of the teacher-level factors identified in this study.

Table 5
Participant Information

Role	**Participant**	**Program**
Administrators	Mike	World Languages and Cultures (WLC)
	Erica	International Teaching Assistant Program (ITA)
	Bethany	Intensive English Program (IEP)
Technical and pedagogical support personnel	Samantha	WLC
	Adam	IEP/ITA
	Dave	IEP
Teachers	Susan*	WLC
	Kate*	WLC
	Randi*	WLC
	Kyle	WLC
	Jade*	ITA
	Ally*	ITA
	Sally	ITA
	Sammy*	IEP

*Exemplary technology-using teachers nominated by the administrators

Research Question 1: Teacher-Level Factors

The ecological perspective suggests that, as the keystone species in the teaching ecosystem, teachers are likely to have the strongest impact on overall technology use

and integration (Zhao & Frank, 2003). Therefore, it is important to understand the factors that are directly related to teachers themselves. The first research question is stated as, "What are the teacher-level factors impacting university-level language teachers' technology use or non-use?" To address this research question, teacher interviews, classroom observations and post-observation notes were used. The analysis of the data indicated that the teachers' *beliefs about the role of technology, daily technology use, technical skills*, *training in technology*, and *professional/research interests* were teacher-level factors that impacted university-level language teachers' technology use and integration. Following is a description of these teacher-level factors.

Beliefs about the Role of Technology

Teachers' beliefs about the role of technology in language learning and teaching seemed to impact what kinds of technologies they used and to what extent they used them. Exemplary technology-using teachers and limited-technology users had major differences in terms of how they viewed the role technology played in language learning and teaching.

One limited technology-using teacher, Kyle, did not believe that technology would add any value to his teaching, so he used technology in his teaching as minimally as possible despite the various technological resources and support systems available to him. He even considered technology as a distractor for students especially when it was not tied to a sound pedagogical aim. He stated:

> I am not convinced yet that I need that level of sophistication [technology] in order to highlight the learning goals even very microscopically … I have yet to be

> convinced that … the pedagogical outcome will be more effective if I use the technology. (Kyle, WLC, interview, p. 15)

Kyle also had a very limited conception of the uses of technology for language teaching and learning, and he was not aware of the capabilities of technology that would contribute to language acquisition. He conceived computer technology as performing only automated lower-level cognitive tasks. The results indicated that Kyle did not know that a variety of technological tools were available for higher-level complex tasks he used in his teaching. He remarked:

> They [students] may have been exposed to a lot of online education or as I would like to call it online training, which is often much more linear, much more information based, much more multiple choice based, not open-ended kinds of experiences, not process oriented experiences, like the very heavy duty process oriented writing teaching that I do both in German and in English where the projects get developed over time. (Kyle, WLC, interview, p. 10)

Sally, another limited-technology using teacher, on the other hand did not have negative beliefs about technology as much as Kyle did. Sally valued technology when it is pedagogically useful to achieve certain teaching goals rather than being the central focus as she remarked: "I do not think it [the role of technology in language teaching] is central to tell you the truth. I think what can happen is that technology can drive the pedagogy and I think it should be the other way around" (Sally, ITA, interview, p. 5).

Exemplary technology-using teachers believed that technology was pedagogically useful to meet certain learning objectives rather than being the major

focus. In this regard, they used terms like *facilitator*, *minor role*, *just another medium*, and *not central* to describe the role of technology in their teaching. For example, Susan remarked on how technology played a facilitating role in making the content more meaningful to students.

> For me, I would say, it is still a facilitator … I do not think technology can replace entirely the role of a teacher, and I guess, instruction. But, at the same time, though, it is certainly an important tool in an instructor's hands. I do not want to call technology a means to an end because it is more important than that but technology can definitely enhance, facilitate, and make the content that you are teaching more meaningful to students. Technology can make language learning seem more purposeful, perhaps, but it certainly connects and enhances instruction. It brings students together; it connects students to the content in ways that a teacher in a traditional classroom alone cannot do. Actually, [I] believe that. (Susan*, WLC, interview, p. 6)

The findings indicated exemplary technology using teachers in this study believed that technology was pedagogically useful for *extending learning beyond the classroom*, *providing visual enhancement*, *providing opportunities for authentic language input and output,* and *implicitly teaching additional skills*. The participants' perspectives on each of these contributions of technology will now be reported.

Technology extends learning beyond the classroom. Some teachers in this study, like Kate, Jade and Susan commented that they could design some activities that did not require as much teacher intervention using computer-mediated environments.

The result is that they could have more time in class for other activities. For example, Susan stated:

> Technology can also allow better time management techniques, where it lets me cover and review more content in a given semester, because I can sort of export content that I feel students can handle on their own whether it is grammar review, vocab review. I can design that as a supplement. And technology facilitates that because you can design the exercises so that they are automatically corrected. Students can go back, and I don't have to take the time to go through manually and mark incorrect answers depending on the way you can set up certain activities. Those programs can do that for you. (Susan*, WLC, interview, pp. 7-8)

Likewise, Kate stated that she used a course management system to do some tasks online because she had a limited amount of time in class that could be used for other activities. She said:

> Outside the class, like I said, since I [don't] want them to lose their time because they have, we have only 50 minute[s] to teach Spanish. So outside the class, they do readings, the online readings. They have to read and they have, like, comprehension questions or vocabulary questions about the reading. And then they have also for writing … they do it at home and they send the, they send their composition online using WebCT or Blackboard. (Kate*, WLC, interview, p. 13)

Jade also considered technology to be a mechanism for saving time in the classroom. He mentioned that technology could provide individual tutoring for every student, which was almost impossible for an individual teacher to do in the classroom. He stated:

> The best thing I like about technology is that you kind of reduce your teaching load … and there is, because language teaching is sometimes an individual thing and teachers do not have the time and effort like energy to kind of tutor every student in the classroom and technology helps. Like, tutoring those students like in, especially, give them chance for independent study. And this is something teacher[s] cannot do, so it is more like a complementary materials that teachers can use to, to enhance his, kind of, pedagogy. (Jade*, ITA, interview, p. 5)

Jade also commented that, particularly in teaching pronunciation, technology could do things that were impossible for a teacher to do in class. He said:

> You cannot open your mouth and show your students your tongue movement when you are pronouncing a sound. But the technology, the program really demonstrates what you can do or how you actually pronounce certain sounds. (Jade*, ITA, interview, p. 5)

One limited technology-using teacher, Kyle, on the other hand, did not find such out-of-class activities helpful. Rather, he opined that they might discourage students from attending classes regularly and prompt them to think that it was the machine teaching the language, not the teacher.

> I am up implacably opposed to the idea [allowing students to think it is the computer that is teaching them]. It is me. I teach them. I provide the content. When then they are interacting with the CMS [Course Management System], it is easy for them to forget that. (Kyle, WLC, interview, p. 10)

Technology provides visual enhancement. Another role that exemplary technology-using teachers saw for using technology in this study was to provide *visual enhancement* for students. For example, Kate stated that she was using PowerPoint in her classes to provide multimodal input for her students. She said:

> Because if I am talking in Spanish all the time, and I do not have the PowerPoint. I have the PowerPoint like a backup for them. Like if I say [says something in Spanish] so they can see it written. That is why I am using it. I guess, to have more access for the students, to have access to whatever I am telling them or for visual, like if I am teaching about, I do not know, [for example] the body, they can see a picture. (Kate*, WLC, interview, p. 2)

The classroom observation data also confirmed Kate's use of visuals in presenting the content. The researcher could observe how Kate provided correct spellings of Spanish words in written form, as well as how she used pictures to explain what the example sentences in Spanish meant. For example, she had a picture of a dinner table next to the sentence *La mesa está puesta* which means "the table is set" on one of her slides (Classroom observation, March 20, 2012).

Similarly, Randi stated that she used PowerPoint to provide visual enhancement to what she was teaching by writing on slides. When Mike nominated Randi as one of

the exemplary technology-using teachers, he stated that Randi used the digitally-enhanced classroom a lot. During an interview, Randi explained how she used the interactive whiteboard to write on her PowerPoint slides:

> I have taught in our high-tech classroom [digitally-enhanced classroom]. My great love in that classroom besides the Elmo, which I can get in any of my classrooms, is the SMARTboard … because my PowerPoint slides are designed so that I can write on them. So for upper level classes, I can do syllabification on poetry. I can write on it as if it were an overhead slide but using the different colors and writing directly on the PowerPoint. Or for language class, I will present sentences with errors in it from their exams, and then we can go over them and correct them by writing directly on them. Of course in the next slide, I put the correct answers anyways, but writing on it and showing the process is pedagogically valuable as well as a timesaver (no need to write the sentences on the board). (Randi*, WLC, interview, p. 11)

During the semester in which the interviews were conducted, Randi did not teach in the digitally-enhanced classroom because it was booked by other instructors. However, because her purpose was to use the interactive whiteboard in that room, she began looking for other technologies that she could use to accomplish what she wanted to do. She stated, “I would like a laptop or something I can take into the classroom that I can perform the same function with. Such technology is worth pursuing for me because I found it useful” (Randi*, WLC, interview, p. 12). When the researcher observed her classroom the following semester, Randi used a tablet PC and a digital pen to write on

her slides which confirmed that she pursued her goal of finding an alternative solution and she was given the technology she needed. In the post-observation meeting, the researcher asked Randi whether she saved and shared those notes with students and she responded that she did not because she felt that students needed to be responsible for taking notes themselves (Post-observation, Oct 14, 2011).

Technology provides opportunities for authentic input and output. Another role that teachers saw for using technology in this study was to provide *opportunities for authentic language input and output*. For example, Randi commented on how technology could help students locate the language within real life context, rather than just a textbook. She stated,

> I specifically do not want them to think like some people who graduated from high school with me. I am fairly sure that they located Spanish within a textbook and not within a real life context… Technology allows students to watch a soap opera, watch a movie, listen to a radio station, watch music videos on YouTube. Whatever they want. They can have conversations with Skype with people. (Randi*, WLC, interview, p. 13)

Ally also opined that she could bring in a variety of language inputs for her listening class. As a result, students could hear real language from different people, rather than just listen to the teacher all the time:

> I mean in general it provides students with a lot more variety of input and I like that a lot. So, when I teach listening then I always try to bring stuff in so that it is not just me they listen to and it is not just their textbook which is very scripted

> but it is more interesting things that are well done, like the TED talks or something or some of the other lectures on iTunes, iTunesU, they have a lot of lectures. So, I think just a variety of input, it is really key. (Ally*, ITA, interview, p. 9)

Another ITA instructor, Jade showed a YouTube video titled “Life After Death by PowerPoint 2010” when he was teaching presentation skills to his ITA students. On one hand, it was a funny way of showing what not to do while preparing presentations, which immediately attracted students’ attention. On the other hand, it was authentic language input because students were able to listen to someone other than the teacher. (Jade*, ITA, classroom observation, March 27, 2012)

Additionally, Susan commented on how students could engage in real life conversations with people at their own age by using communication technologies.

> Through like the tele-collaborative projects, I have my classes/students communicating with people usually of the same age, you know, students the same age in France, and that makes it more real to them and more fun and more interesting. It livens up, if you will, brings life, I think, into the content. (Susan, interview, p. 8)

The findings also indicated that some teachers used certain technologies to provide opportunities for students to produce language and reflect on their own speaking and pronunciation skills. In this regard, Ally explained how she used Wimba VoiceBoard—an audio-based forum.

> I like giving students the control of and the responsibility for recording themselves for the homework, you know, when I do the VoiceBoard. And the feedback I have gotten from students, they really like being able to playback and listen to their own voices. I think they do not have a lot of those skills to kind of self evaluate their speaking or they will think that they say one thing and then they listen and they are actually saying another thing. And so I think giving them the opportunity and kind of making them do it over and over every week will hopefully, you know, strengthen their own perception skills and their skills of evaluating themselves. So, that is something I like about it. (Ally*, ITA, interview, p. 5)

Randi also used VoiceBoard to have her students record their audio assignments. She provided the same platform to give feedback on students' speaking skills, as she explained:

> I am doing it [giving audio feedback] because they recorded the assignment, so it is logical to give oral feedback. I also do so out of necessity … I cannot transcribe their whole recording. I cannot correct every single error. If I did correct every single error, they would not absorb it. So, what I do is, in terms of grading for myself, I give myself 10 minutes with it. I can usually listen to it twice. I take detailed notes as far as I can on the major things and I try to emphasize that in the feedback. I try to tell them what they have done well but also what they need to work on. (Randi*, WLC, interview, p. 7)

Technology teaches additional skills. A byproduct of using technology is that in addition to language acquisition, students implicitly gain skills that are transferrable to other areas of their lives. Teachers in this study commented that because of the role that technology was playing in their classrooms, they were implicitly teaching additional skills like self-responsibility and media literacy. For example, Sammy stated that technology forced students to be more proactive about their learning. She said:

> In my mind, [technology] forces them to take self-responsibility. I post the homework every week. It is a responsibility to look it up and to do it. And I do some similar things during lab, too. There is, the grades are on there, so it is their, you know, they do not have to come to me and ask their grade, they can check it themselves. (Sammy*, IEP, interview, p. 6)

Similarly, Susan, WLC thought that students enhanced their media literacy skills and became more flexible learners when they were required to use and learn new technologies for their language assignments.

> I think that there is also a professional skill set (or procedural goals) that we are indirectly teaching students when we can use technology in the classroom… They get practice with Publisher in my class. And then perhaps one day they end up in a job needing to know how to use this software. Students are kind of learning some of those, maybe, soft skills as well as building their confidence using different types of technology, and this of course can serve them in their future employment. (Susan, WLC, interview, p. 8)

Overall the results indicated that teachers' beliefs about the role technology played in language learning and teaching seemed to be impacting what kind of technologies they used and to what extent they integrated technology into their teaching. If they did not believe that technology had merit in what they were trying to teach (e.g. Mike), they preferred to avoid technology as much as possible. If they believed that technology would enhance their teaching, they pursued a language teaching pedagogy that included technology. For both exemplary technology-using and limited technology-using teachers, tying technology to a pedagogical goal was the key element. In particular, exemplary technology-using language teachers in this study believed that technology was pedagogically useful in language teaching because it *extended learning beyond the classroom*; it provided *visual enhancement*; it provided opportunities for *authentic language input and output*; and finally students implicitly learned some *additional skills,* which could be helpful in their personal lives or future careers. Another teacher-level factor, daily technology use, will be reported next.

Daily Technology Use

Participants in this study were using technology daily both personally and professionally and that appeared to impact their technology use and integration for language teaching purposes. As mentioned in chapter 2, six teachers in this study were nominated as exemplary technology-using teachers. One common characteristic of these six teachers was that they were highly connected to technology for both personal and professional use. They appeared to be heavy technology users in their daily lives. For example, when Susan, WLC was asked what kinds of technologies she used in her

personal life, she listed quite a few technologies including a smart phone, e-mail, texting, internet, online sources, online dictionaries, different sorts of language sites, and Microsoft Office programs. Overall, Susan commented that technology was something she could not function without:

> I cannot live without it [technology] on a personal level. I cannot go an hour without checking my e-mail. I mean, it is definitely a necessity, I think, in those sorts of tele-communicative purposes. Certainly, it is a necessity, I think, in any kind of curricular development … I almost forget how to write now, because everything you are typing … PowerPoint in lessons, Word for lessons so on so on. So, I guess, yeah, it is really a necessity. Something I certainly cannot, you know, cannot function without. (Susan*, WLC, interview, p. 6)

In addition, Ally indicated that she had a smartphone and a computer for all her needs. She stated that she checked her e-mail and read news online. Similarly, Sammy stated that she used e-mail, chat and Facebook to stay connected to her family and friends.

The two teachers who were nominated as limited technology users—Sally and Kyle— had some major differences in terms of their daily technology use. Sally used as much technology as the exemplary technology-using teachers. Kyle, on the other hand, described himself as a late adopter of technology and seemed more cautious about using technology both in his personal life and in his teaching. When Sally was asked about the kinds of technologies she used in her personal life and teaching, she listed e-mail, Internet, videos, tools on a course management system, and PowerPoint (Sally,

ITA, interview, p. 5). Kyle, on the other hand, explained why he preferred not to use media technologies.

> I tend to be a little bit of a late adopter of, of media technologies. My mobile phone is still a dumb phone, very robust dumb phone. I am, in certain ways, again I am also a late adopter. I read paper newspapers, for example, because I find them much more sophisticated, random access devices… So I do not use say tablets, iPads, electronic readers because I find that they limit my accessibility to the text in a random way. And I find it in many cases, the old case bound paper book to me is a visual kind of organization and a special kind of organization that is much more effectively accessible than it would be tablet or PC. (Kyle, WLC, interview, p. 8)

In sum, the findings implied that teachers who enjoyed technology in their daily lives and had a general interest in technology were more inclined to use and/or experiment with different technologies for language instruction. On the other hand, if they did not use technology in their personal lives they were less likely to use it in their teaching. The discussion now turns to another teacher-level factor, *technical skills*.

Technical Skills

The teachers participating in this study were asked how they rated their skill and comfort level when they are using technology. All the teachers, except for Kyle, remarked that they considered themselves to have moderate or high technical skills. Jade and Ally considered themselves to maintain high skills. For example, Jade stated that he felt comfortable learning new technologies:

> I think I am pretty proficient with computer, no problem with any, I can pick up a program, like a new software pretty soon because I was focusing on Computer Assisted Language Learning in my master study. So, I am very interested in learning some new program, the software especially related to language teaching and learning. (Jade*, ITA, interview, p. 3)

Teachers who rated themselves as having moderate skills commonly used a broader range of software applications, and they typically were able to troubleshoot most hardware and peripheral problems without assistance (Rakes, Fields & Cox, 2006). These teachers explained that they did not consider themselves possessing high technical skills because they could not do programming or create their own webpages. However, they could figure things out on their own and perform the tasks that they needed for teaching. Sally stated:

> I mean I know how to do typical things of managing our Moodle and, and creating PowerPoints, and inserting images and videos and that sort of things. But I do not do any programming myself. (Sally, ITA, interview, p. 6)

Overall, the results for *technical skills* indicated that teachers did not necessarily need to have high technical skills to use technology for teaching purposes. However, the comfort level when faced with a new technology, and whether they could troubleshoot peripheral problems without assistance, seemed to contribute to sustaining their use of technology. Following is the next teacher-level factor, which is the impact of training in technology on overall technology use.

Training in Technology

The teachers in this study were asked if they had received any formal training in using and integrating technology to investigate to what extent formal CALL training would affect their technology use. Out of the eight teachers who participated in this study, three exemplary technology-using teachers (Jade, Ally, and Kate) had received specific training in technology related to language learning and teaching. Kate had some preparation on using technology in language learning during her graduate work. Jade and Ally had received, or were working on their advanced degrees in Applied Linguistics and Technology. Therefore, those two teachers had taken quite a few technology-related courses in which they learned about the theoretical and practical applications of CALL. Jade stated:

> We took a class like [Computer Methods for Language Teaching] which is a technology related course which is to help language teachers to develop some computer mediated materials and this is kind of also very good education experience. (Jade*, ITA, interview, p. 11)

The other five teachers (Sammy, Randi, Kyle, Susan and Sally) on the other hand, did not receive any formal training in how to use technology for language learning and teaching purposes. Out of these five teachers three (Sammy, Randi, and Susan) were among the exemplary technology-using teachers. These teachers used other approaches, like self-teaching, to learn about using technology. For example, Susan stated that she read a lot on her own and familiarized herself with the CALL literature. She said, “So, I have done a lot of outside reading that was not a part of my graduate

education but I felt I needed to do to perform well in my functions here, in my first appointment" (Susan*, WLC, interview, p. 2).

Overall, it appeared that although training in technology seemed to be contributing to successful technology use in language teaching, lack of training did not really create a barrier for teachers if they believed technology would contribute to their teaching. They found other ways to learn about technology that might support their instruction, and as well as how to use the technology. Now, the last teacher-level factor, professional research interests, is presented.

Professional/Research Interests

The faculty members in this study had research responsibilities in addition to their teaching loads. It might be interesting to note that there was an apparent connection between faculty's research interests and their use of technology in instruction when that use of technology was closely aligned with their research agenda. For example, Kate conducted research in the area of computer assisted language learning and she had published journal articles about using different technologies in her teaching. When Kate was asked about why she used technology in her teaching, she responded:

> The main reason [is] research, because I like the area. When I learn something new, when I can give something to my students, I also get something for myself. I did recently a project with listening. Listening with audio or just with the video and to see the results and who did worse and who did, you know. So, it is good

> for me. I get data from them, they get [a] different tool and also, yeah it is like everybody wins. (Kate*, WLC, interview p. 17)

Kate implied that she probably would not be using a lot of the technologies in her teaching if she were not required to publish.

> Probably if my position was not like Assistant professor and I did not have to worry about tenure … not so involved with technology, because you know if I am teaching like three course[s] every semester, I do not have the time. So, I probably will be teaching with the regular things and that is it. But I am using it more for research. (Kate*, WLC, interview, p. 17)

On the other hand, Randi commented that she was probably not aware of different technologies because she did not read journals about them, as it was not her research area. Randi acknowledged that she learned more through having a personal interest rather than a research interest as she stated:

> But, there are other technologies I am sure that I am not aware of. And keep in mind, my research is in literature. I do not research technology and technology applications in the classroom or even pedagogy; I do not get professional journal about this (though I am on a few generalized list-servs and mailing lists such as CELT and Tomorrow's Professor)… Because my research is on literature … All of the technology that I use, has been through personal interest because I thought would be helpful in the classroom, for class business, and for students. (Randi*, WLC, interview, p. 14)

Mike, one of the administrators in the study, also commented that teachers' research responsibilities might be taking away from time spent on developing technology-enhanced activities. When Mike was asked about why he thought some teachers were probably not using technology, he stated:

> Could be, they have research, other research that is not technology related … For some faculty, the objects of what they do are technology related, but a lot of the objects of what some faculty do is not technology related … So, you know, time spent on research can take away from class course development, because faculty have research, teaching and service responsibilities. So, if they are spending a lot of time on research, it might take away time from other areas that are not an immediate priority. (Mike, WLC, interview, pp. 11-12)

Overall, the findings indicated that if technology was a professional research interest to teachers, they were more willing to invest time in learning and developing technology-enhanced activities. They would also be more willing to experiment with innovative technologies to test and develop research projects. If technology was not a research interest though, they would still use technology to meet certain learning objectives.

In sum, the first research question investigated the teacher-level factors that impacted university-level language teachers' technology use and integration. The findings indicated that teachers' *beliefs about the role of technology, daily technology use, technical skills, training in technology*, and *professional/research interests* had impacts on technology use in language teaching and learning at the university level. The

discussion now turns to the second research question, which investigated the ecosystem-level factors that impact university-level language teachers' technology use and integration.

Research Question 2: Ecosystem-Level Factors

As described in greater detail in chapter 2, the ecological perspective suggests that factors at different layers of the ecological hierarchy might have an impact on teachers' technology use and integration (Zhao, 2003; Davis, 2008; 2011). Therefore, the second research question asked "What are the ecosystem-level factors impacting university-level language teachers' technology use or non-use?" This question investigated the ecosystem-level factors impacting university-level language teachers' technology use and integration through several methods: interviews with teachers, administrators and technical and pedagogical support personnel; field observations; classroom observations; and post-observation notes. The analysis indicated that ecosystem-level factors that impacted university-level language teachers' technology use and integration were *access to technology*, *funding opportunities*, *administrative support*, and *professional development*. In the following section, each ecosystem-level factor will be explained.

Access to Technology

The findings suggest that access to technology as an ecosystem-level factor contributed to language teachers' overall technology use and integration. The results indicated that the three research units had access to a range of technologies that could

be used to enhance language learning and teaching (See Table 6). Access to technology in each program will now be described.

Table 6.
Technologies available in each program

Program	**Available Technologies**
World Languages and Cultures	- Main Computer Lab (20 computers, headphones, scanners, printers) - A TV set with satellite dish network, - Media collection and subscriptions, VHS tapes and DVDs, - Polycom videoconferencing system - Still cameras, video cameras, tripods, audio recorders, green screen equipment, - Tablet PCs and laptop carts - A digitally-enhanced classroom
International Teaching Assistant Program	- Computer labs, media-enhanced classrooms, - Pronunciation lab and pronunciation software, - Laptops for teacher and student checkout, - Laptop carts, - Flip cameras and video capturing and transfer devices
Intensive English Program	- Language learning lab (20 computers), headsets - A laptop cart, - Video recorders and tripods for teacher checkout, - Audio and media library

The first unit, World Languages and Cultures (WLC) seemed to have a great advantage over the other two programs by running a Language Studies Resource Center (LSRC). The LSRC main computer lab was designed as an open lab where students could come in and work on their assignments or projects. The lab had 20 computers that are dual boot with Windows and Mac and two printers.

Each computer station included headsets and scanners. The field observation data indicated that students used these computers to watch presentations and videos, to record audio, and to type papers. For example, the researcher observed a few students watching videos on Yabla—a video hosting website for language immersion through video (Field observation, Oct 22, 2012). For another example, during one of the field observation sessions, one student was watching a pre-recorded presentation and occasionally recording herself speaking Spanish (Field observation, Oct 22, 2012).

In addition to the computers, the LSRC had a TV set which students used to watch films. Samantha stated:

> We have dish network in there, so students can ask for, so we have French television, Spanish, Arabic, Chinese and they can, we have little transmitters and so they can set and listen to it or watch it. And it is on a lot of time during the day. (Samantha, WLC, interview, p. 4)

The field observation data confirmed Samantha's statement that the researcher observed three students watching a French film with English subtitles. Each student had headphones that were connected to the TV via transmitters so that they did not need to hook up anything to the TV (Field observation, Oct 22, 2012).

The LSRC also serves as the instructional technology hub of the WLC department, providing specialized media resources and support for language and culture classes. Several other resources are available for students and teachers such as a media collection and subscriptions, VHS tapes and DVDs. Teachers also had access to equipment that they could check out such as still cameras, video cameras, tripods, little

recorders, green screen equipment, tablet PCs and laptop carts. The LSRC also had a *Polycom* video conferencing system allowing individuals to meet at-a-distance. This system is used for computer-mediated communication projects, as indicated by Samantha:

> There is also a Polycom system which they [teachers] have been using to do one-on-one meetings with students in Argentina, and so students can sign up to meet with the student in Argentina. And they meet once a week and have chats. (Samantha, WLC, interview, p. 4)

Teachers teaching in WLC were quite happy with the service they received through LSRC and considered themselves lucky to have such a center, according to Susan:

> We are very lucky to the LSRC and the accompanying activity fee, so that has built up a budget that has made it possible for the LSRC to acquire software, licenses… I have always, whatever it is I wanted to do, found somebody who has found a way to help me make it happen. (Susan*, WLC, interview, p. 9)

Another teacher, Kate, highlighted how she could request any kind of technology if the LSRC did not have it:

> If I want to use something that I do not have, I will ask the LSRC director or the chair of the department. And they are, actually, they are very supportive with technology. That is one of the things that I like being here in this university. (Kate*, WLC, interview, p.15)

Even though Kyle was not a heavy technology user, he appreciated the fact that he knew where to go if he needed any resources as in the following quote:

> We have a lot here in WLC. And it is very useful, the language resource center does help us a lot with, with additional resources … It is very rare that I feel like Oh, I do not know where to go for, for specific materials that I need for my teaching. (Kyle, WLC, interview, p. 14)

The second research unit, the International Teaching Assistant (ITA) program had access to computer labs, media-enhanced classrooms, pronunciation software, laptops for teacher and student checkout, laptop carts, flip cameras, and video capturing and transfer devices. The findings indicated that teachers had access to technologies that they needed to teach oral communication skills to international teaching assistants, as Jade pointed out in his interview:

> The Speak and Teach [ITA] program pretty much offers all the things. We have audio recorders, camcorders, and also Pinnacle device, webcams, and also we have pronunciation lab … So, in case I want students to work on something with a computer, I can bring them to the lab. So I think I have very easy access to technology in the program … And also we, we have laptops in the Speak and Teach [ITA] program and sometimes I, there is a computer cart and I can kind of take our laptops to the classroom in case I want students work on some programs, kind of work on some pronunciation software. So, I brought laptops to the classroom. (Jade*, ITA, interview, p. 7)

Teachers in the ITA program seemed to make great use of video-recording technology because they wanted to record their students' oral presentations and provide feedback. In this regard, Sally used flip cameras that she borrowed and commented: "[ITA] program has, loans us the equipment, so I have a flip camera to use, to make a digital recording" (Sally, ITA, interview, p. 7). Similarly, Jade described using the Pinnacle device:

> I use Pinnacle which is a video transfer device to record students' presentations because there will be three major presentations in the class … And Pinnacle is a really [small] device which is connected to the microphone in the kind of built in microphone and also built-in camera in the classroom. So, it is pretty convenient. So, you do not have to carry a camera with you or microphone with you. It can just take that small piece of device connect it to the cord in the classroom and it can, it can record student presentation with video. (Jade*, ITA, interview, p. 4)

Another common technology used in the ITA program was the pronunciation lab that maintained six computers and headsets. Each computer had a variety of pronunciation software programs, which were also installed on laptop computers that the students could check out. This was especially helpful, since students in the program were required to spend a certain number of hours in this lab to work on their pronunciation skills and their individual oral communication problems. Jade mentioned how he liked the pronunciation software to show pronunciation patterns that he himself cannot do as a teacher. He said:

> I personally like it [the pronunciation software] very much. There is very clear instruction and videos, video tutorial and also some pictures showing the, your tongue movements, when you pronounce a sound. So, you cannot really do that in class, right? You cannot open your mouth and show your students your tongue movement when you are pronouncing a sound. But the technology, the program really demonstrates what you can do or how you actually pronounce certain sounds and also show[s] the sound graph [to] compares your, kind of, speech with a model speech and show[s] the discrepancies. And those are cool kind of technologies students are using right now. (Jade*, ITA, interview, p. 5)

Other ITA teachers, like Sally, were not as familiar with the capabilities of the pronunciation software and therefore, did not know what students did with the software:

> We, the students are using some software but I do not actually teach them how to use that software and work with them. They go and they are supposed to go over to the lab … It is a pronunciation software. They have a couple of programs and they choose what they want to do. They are supposed to spend a certain amount of hours working on it. But I do not supervise that and ... the feedback that I have gotten from the students has not been wildly positive about it. (Sally, ITA, interview, p. 11)

All the ITA teachers in this study stated that they held their classes in regular classrooms—not in a computer lab. However, Erica indicated that she did her best to

schedule classes in media, or technology-enhanced classrooms to facilitate technology use in teaching oral communication skills as she stated:

> For example, I have also scheduled classes in the lab of the Foreign Language Department here. They have a, a smart technology in the lab. And this semester I scheduled them basically here, mostly here in [building name] because there is this Pinnacle technology installed in [building name] classrooms. And they, they wanted to record their students' performances on certain assignments for independent, or I mean individual office hours with students, you know, to discuss their individual performance. So, I am giving them the Pinnacles and I schedule them in classes that have this Pinnacle technology. (Erica, ITA, interview, p.2)

Jade also mentioned how his classroom was equipped with the technology that he needed, even though it was a regular classroom. He stated:

> It is a regular classroom but there is a[n] overhead, there is a computer projector on the ceiling and also the speakers in the room and the Pinnacle cords and a microphone as well. I think the classroom is enhanced with technology although it is not in a computer lab. (Jade*, ITA, interview, p.7)

Although teachers in the ITA program were mostly content with the access they had to technologies that they needed for particular purposes, Ally pointed out that she did not really know what she might be missing. Ally was aware that others might be using technologies that she did not know how to use and commented:

> I mean, I think the way I am doing is just fine. But I know just doing other research projects with other people who teach in [building name], who teach languages over there, some of them are using some really cool technologies, like the smartboards or whatever that is called. And so there is different things that are available that I do not know how to use and that are not available to me in the classroom where I am. (Ally*, ITA, interview, p. 9)

Overall, the ITA program seemed to have a number of technologies that were specifically useful for oral communication, such as video recording technologies and multimedia stations for aural input. ITA teachers also seemed content with the technologies made available for them, which contributed to their technology use for language instruction. However, some teachers, like Ally, commented that they did not know what they might be missing.

The last research unit of this study, the Intensive English Program (IEP) had a language-learning lab, a laptop cart, and video recorders and tripods for teachers to check out. The language-learning lab had 20 computers for students to work on and a lending library. The lending library, located in the same room as the language-learning lab, included a small collection of media (i.e. audio library and DVDs) to support students' English studies. The language-learning lab is reserved for classes in the mornings and early afternoons; otherwise, the lab is open to students. According to Dave, most teachers made little use of the lending library.

Another technological resource that was specifically designed for IEP was the e-learning site that Dave developed. According to Dave, this e-learning site is somewhat like a course management system:

> Some of the teachers who don't use a Moodle course provided through the English department, who don't use technology as much as some of the other teachers, they have like a simple teachers' page in the e-learning site, which is where they can assign homework or just have their contact information, and a copy of their syllabus. (Dave, IEP, interview, p. 2)

There were a few things that Bethany wanted to invest in to encourage faculty members to use more technology in their classrooms. For example, teachers did not have their individual computers in their shared offices and Bethany stated that it was her goal to have a computer on each teacher's desk (Bethany, IEP, interview, p.4). As the program director, Bethany also mentioned that she tried to purchase software if there was a request for it by the teachers or the language lab coordinator. She remarked, [If] there is something that a teacher wants, we try to get it … my philosophy is, you know, [if] teachers think they can use [it], go for it. (Bethany, IEP, interview, p. 5)

The language lab coordinator, Dave, on the other hand, indicated that he had issues with installing CALL software in the language-learning lab since he did not have administrative privileges on the computers. For him, it was hard to get resources because technical support was so centralized at the departmental level that he could never know if his request would be processed as he explained:

> One of the constraints of working here is, when I first started the job, I was really interested in CALL software, not online stuff but software that we can purchase and put on the labs here … But, our tech support system is kind of highly structured so that it is a lot of work to purchase a software tool and get it installed. It takes more than a year. And there is no guarantee that if I put in a request that it will actually happen. So I kind of gave up on that pretty early on … There is a ton of stuff out there, but it is just too, this institutionally is way too difficult to. So, I just decided to put my energy and time into other activities. (Dave, IEP, interview, p. 5)

One IEP teacher, Sammy, thought she had access to what she needed in terms of technology. She was running her synchronous labs on Moodle and students could use either their own computers or any computer lab on campus. She stated that she did not need any hardware or software; however, having a resource page where she could get ideas for different language learning activities would cut down her preparation time.

In sum, access to technology was a little more limited for IEP teachers since they had to use regular classrooms and public computer labs for the classes, and the kind of classroom they would get, or the software that was installed in different computer labs around campus was unpredictable and out of their control prior to start of classes. Besides, it appeared that it was difficult to make good use of the existing computer lab—the language-learning lab—because of the centralized technical support system. However, it seemed to be working fine for the one IEP teacher who participated in this study.

Although teachers in this study seemed to have access to technologies they needed for their particular classrooms, which contributed to their technology use for instructional purposes, they had a few challenges. In particular, Randi and Kyle were unhappy with the time spent on setting up the technology or addressing technological issues that should have been spent interacting with students. For example, Randi said:

> I really believe that in any class you need to establish rapport with your students, and those 10 minutes before and after class are really valuable for doing so. If you are forced to use that time connecting cables or trying to make technology work, then that is a missed opportunity. I want technology to work for me and my classes, to simplify and facilitate things. Very often it does so, but it could work better. At times I do miss the idea of just walking into the classroom and being ready to go – no tech set up. (Randi*, WLC, interview, p. 22)

Similarly, Kyle was not happy with the maintenance of the instructional technology across the campus which created problems for him. Such technical issues discouraged Kyle from using technology. He stated:

> Every second of my classroom time and my students' classroom time, it is wasted by that kind of hardware, firmware, software issue, is unrecoverable. It is absolutely unrecoverable. And I am far better off having ignored, ever having conceived of using the technology, right, by this, every minute I waste in a classroom with 25 students, it is almost a half an hour of person time wasted. (Kyle, WLC, interview p. 16)

In sum, the three programs had access to a variety of technologies that could serve for language teaching purposes as summarized earlier in Table 6. In this regard, the WLC had the advantage of running a Language Studies Resource Center equipped with a vast array of hardware, software, and technological tools. The ITA program had access to more specific technologies that could be used in teaching oral communication and pronunciation skills. Access to technology in the IEP was a little more limited compared to the other two programs, but this was not a concern for the one IEP teacher who participated in this study.

Overall, the participants were satisfied with their access to technology that complemented their classroom activities and provided more opportunities for learners to improve their learning of a language. However, as was the case with Randi and Kyle, some participants did not want to spend too much classroom time addressing technical issues. Another ecosystem-level identified in this study was funding opportunities, which will be reported next.

Funding Opportunities

The results indicated that grant opportunities provided for teachers and administrators contributed to language teachers' technology use and integration. In the case of language teaching at the university under examination, the findings indicated that there were three funding sources that provided grants for teachers or programs: an international corporation, university-wide grants, and college-wide grants.

In terms of the international corporation, LSRC set up a digitally-enhanced classroom through a generous donation from an international corporation. The facilities

in this room were described in detail in chapter three. Samantha acknowledged that WLC teachers used this room quite a lot as she stated “I know that the, what we refer to as [corporation name] room is used a lot…I think from 8 to 5 there is someone in there, pretty much every single hour there is a class in there” (Samantha, WLC, interview, p. 5).

In terms of university-wide grants, two funding opportunities were mentioned by the participants: the Miller Faculty Fellowship Program and Computing Advisory Committee (CAC) grants. The Miller Faculty Fellowship Program allows faculty “to enhance their scholarly work in the undergraduate academic programs of the university and to develop innovative projects to enhance student learning” (Miller Faculty Fellowship Program for 2012-2013, ¶2). The CAC grant, on the other hand, specifically focuses on purchasing technology that will be used for instructional purposes, as stated in the call for proposals:

> The university-wide student computer fee was established to provide improved computer facilities throughout the university, to stimulate the use of computer-based instruction, and to help place [the university] as a leader in the use of technology for instruction. The focus of this annual call is for projects that have a broad impact on student use of academic technology and represent innovative uses of technology at [the university]. (CAC 2012-2013 Call for Proposals, p. 1)

A few of the teachers and the administrators made use of these university-wide grant opportunities to purchase equipment or to develop materials. For example, Kate reported how she could hire someone to help her with course design and materials development through such grants:

> The resources, I normally get funds from grants. And that is why I can do all these [technology-enhanced activities]. Like I put these courses, I was able to work on the course because of a grant, LASCAC and the Miller grant, Miller fellowships. (Kate*, WLC, interview, p. 17)

In addition, Erica mentioned how she received a university-wide CAC grant to set up the pronunciation lab and to purchase laptops for student checkouts. She also purchased licenses for software through this grant funding as she stated:

> Another thing in terms of supporting the teachers, through, through a CAC grant, I purchased licenses from WebSwami which is a web-based audio, video platform and we piloted it last fall in one section, actually in two sections of 180 [Communication Skills for ITAs], of the intermediate 180 and we developed materials on prosody and those seem to be working fine … So, we are still using that platform. I purchased it for this Fall also, I mean purchased the licenses. (Erica, ITA, interview, pp. 2-3)

Two of the research units—WLC and IEP—were housed in the College of Liberal Arts and Sciences. The college has a grant program called LASCAC (Liberal Arts and Sciences Computer Advisory Committee) that is supported by student computer fees. Faculty members in the college write grants to develop "new instructional projects that involve enhancements of facilities, equipment and software, or development of instructional materials or software for classroom or online learning" (LASCAC 2012 Call for Proposals, p. 1).

Two administrators and two teachers mentioned how they received LASCAC grants to buy equipment or to hire someone that could design and develop instructional materials. For example, Bethany stated:

> We did get uh LASCAC, I think it was LASCAC, money for a, what do you call that, a cart, laptop cart, I guess that is the term … we have it [in the English Department] to make a regular classroom [into] a [computer] lab as best we can. And, so, that is one of the resources. (Bethany, IEP, interview, p. 4)

Mike also stated that a number of WLC faculty applied for LASCAC grants. Kate was one of those teachers who had received and appreciated the financial help from the college. She stated that those grants enabled her to get help to improve her courses:

> Yeah, I try to, to apply to those grants, the LASCAC, the Miller, also for a small, the small LASCAC, they give you money the small quantity but you know to create activities and things like that for the courses … Those are good opportunity[ies] for me to have people to work on what I want. (Kate*, WLC, interview, pp. 17-18)

Overall, the findings indicated that the teachers sought funding through different kinds of grant outlets. It appeared that they appreciated this support because it provided opportunities to purchase technology that was, in turn, used for instructional purposes. Randi stated “the university has also been pretty supportive economically in terms of acquiring technology for teaching”(Randi*, WLC, interview, p.15). Another ecosystem-level factor that contributed to technology use was administrative support which will be presented next.

Administrative Support

To understand the impact that administrative support can have on language teachers' technology use and integration, one needs to start with understanding the administrators' stance on the role technology plays in language teaching and learning. In this study, all three administrators were specifically asked what they thought the role of technology was in teaching languages. The findings indicated the administrators who participated in this study had positive attitudes toward technology and were supportive of using technology to facilitate language learning and teaching. Each administrator's perspective on the role technology plays in language teaching and learning will now be reported.

For Erica technology played a central role as she said without hesitation "Well, you don't have to ask me that. It is central" (Erica, ITA, interview, p. 6). She explained that technology facilitated achieving certain teaching goals with the following comment:

> I mean, it just makes life much easier in terms of achieving certain goals, certain teaching goals … So, if I am the teacher of the course and I know this student has problems with vowels … instead of drilling all of that in the classroom, I can send them to the lab … So the students, as a teacher, I do not have to focus just on this in the classroom because this may be helpful to one student but not the rest of the students, so I can take that away with help of technology… And in the classroom, I would be able to focus on something that is potentially helpful to more than a few students in the classroom. (Erica, ITA, interview, p. 6)

Also for Erica, technology provides opportunities for authentic language input. Thus, students could be exposed to a variety of spoken language, rather than hearing just the teacher all the time. She added:

> You can bring a lot of audio, video of authentic language. And plus because these are ITAs they would need to have language used in an academic setting, in a teaching setting. So, there is this, there is a need for not just input but specific input that is more related to academic language use in the classroom versus anything out there. So, with technology you can certainly do that, right? So, there is a lot of other little angles that technology helps with. (Erica, ITA, interview, p. 7)

For Mike, technology is unavoidable and here to stay. He stated that technology should facilitate meeting certain learning objectives as opposed to using technology just for the sake of using technology. He summarized his philosophy on technology as:

> My own personal take is trying to find the most efficient way to use technology and harmonizing what is an effective approach for the objectives of the class, for example either global objectives for the course, or the specific objectives for that day in class, that is, you have a particular activity that you would like to do. Some activities may lend themselves more readily towards using a particular technology. It is also possible to have too much technology and you know, you sort of don't want the technology to get in the way… If technology can facilitate that learning, that is the ideal. And also facilitate the interaction with the culture, that is ideal. (Mike, WLC, interview, p. 9)

Mike further commented that it was a trade-off between the time it was taking to learn that particular technology, either on the students' parts or the teacher's part. Mike stated:

> If you are spending too much time on learning the software, and you are spending most of your time on learning the software, and you are spending very little time engaged in the actual activity, then, you know, that is not a good trade off. (Mike, WLC, interview, p. 9)

Bethany's views on the role of technology were quite similar to Mike's. She stated that technology had great potential. However, she opined that face-to-face contact was still important. In this regard, she considered technology as a complementing feature by stating "I do see technology as more of complementing what you do in the classroom. So, I think [of it as involving] having a teacher there, getting it [technology] set up, and then sending folks off [to use it]" (Bethany, IEP, interview, p. 8).

Overall, the three administrators of these programs were supportive of technology being used in language learning and agreed that technology could provide opportunities to enhance language teaching and learning. Although Bethany and Mike were a little more cautious about how much technology was needed and for what purposes, they were still supportive of using technology to achieve certain learning outcomes.

The administrators also encouraged teachers in their program to use technology. The results indicated that the administrators thought that they were providing as much

support as possible. In particular, Erica (ITA administrator) and Mike (WLC administrator) supported their faculty members by identifying grant opportunities, providing feedback on annual evaluations, and ensuring that teachers had access to the technology they needed. For example, Erica stated, “I guess I try to provide as much support as I can to them. And part of that is giving them materials to work with. Giving them, you know, and an enhanced opportunity to use some kind of technology” (Erica, ITA, interview, p. 2).

Moreover, Mike mentioned that one of his responsibilities, as a department chair, was to inform teachers about grant opportunities that were available on campus, or to be directly involved in such activities. He stated, “Part of the department chair's job is also to identify grant opportunities and either support faculty who may want to pursue them or being involved in those grant activities herself or himself” (Mike, WLC, interview, p. 2).

Bethany (IEP administrator) stated that she was supportive of technology, but she did not seem to be involved with what teachers did in their classrooms as much as Mike and Erica. For example, when Sammy (IEP teacher) was asked whether she received any incentives for using technology in her teaching she stated, “[being nominated as an exemplary technology-using teacher] was the first any kind of feedback I have gotten that it [what she does with technology] is even acknowledged (Sammy, IEP, interview, p. 12). Although Bethany had some intentions that would encourage IEP teachers to use technology, they did not appear to have yet happened. For example, Bethany stated that she had thought about hiring someone who had an interest in

technology to help other teachers. She envisioned this person to be not only a technology support person, but someone who would identify, collect and share quality materials for teachers to use in their teaching.

Overall, the administrators participating in this study had positive attitudes toward technology and they believed technology could enhance language teaching and learning. In particular, two administrators (Mike and Erica) tried to do their best to support the teachers in their programs in technology use and integration by identifying and raising awareness about grant opportunities, providing feedback through annual evaluations and ensuring access to technology.

The teachers in this study were also asked about the support systems available to them in terms of technology use and integration. They generally referred to funding sources, peer support and technical support. However, two WLC teachers, Kate and Susan highlighted the importance of administrative support. Susan commented, "I have always, whatever it is I wanted to do somebody has found a way to make it happen" (Susan*, WLC, interview, p. 9). Kate also implied that administrative support contributed to her use of technology as in the following quote:

> If I want to use something that I don't have, I will ask the LSRC director or the chair of the department. And they are, actually, they are very supportive with technology. That is one of the things that I like being here in this university. (Kate*, WLC, interview, p. 15)

Overall, it appeared that administrators were aware of the potentials of technology improving language learning and teaching and therefore tried to do their

best to create an environment that was conducive to technology use and integration. Although many of the teachers that participated in this study did not explicitly acknowledge the role of administrative support in their technology use, the other factors they referred to as contributing factors to technology use and integration (i.e. funding sources, access to technology, technical support) might have implications for administrative support because the administrators generally took the lead in providing other resources. The last ecosystem-level factor, professional development, will be reported.

Professional Development

All of the participants were asked what kind of professional development opportunities they had in terms of technology use and integration. Common responses for this question included conferences, workshops, brown bag meetings, and show and tell during faculty meetings.

Teachers who were interested in technology for research purposes attended conferences that focused on technology and language and learned new ideas for technology-enhanced activities as Kate stated, “When I go to conferences and they present something. I, wow, I want to do that”(Kate*, WLC, interview, p. 16).

Administrators and technical and pedagogical support personnel also mentioned that conferences were effective professional development opportunities for teachers and encouraged their faculty members to attend those conferences. For example, Samantha stated, “I know that there is a conference for second language learning and technology. I would like to start encouraging teachers, letting them know of things, like

professional development opportunities that are available to them" (Samantha, WLC, interview, p. 7). Bethany also mentioned that the IEP had a budget for faculty to attend conferences. In addition to these funds, the IEP paid for on-campus activities related to the use of technology in the classroom. As Bethany reported:

> [the] IEP is paying for all instructors who want to [to] the Technology in Second Language Learning [conference]. We have a little pot of professional development money that teachers can use to attend the conferences. But this one … they don't have to take it from their pot of money. So, we try to promote technology [use]. (Bethany, IEP, interview, p. 13)

Another common professional development activity for participants was to attend university-wide or in-house departmental workshops. The Center for Excellence in Learning and Teaching (CELT) at the university offers workshops on the use of course management systems (i.e. Blackboard, WebCT) and other instructional technologies. WLC teachers pointed out that they had learned quite a few things from those workshops. For example, Randi stated, "When I arrived at [the university], I attended a lot of the workshops offered by what is now called CELT, on WebCT and Blackboard, PowerPoint options, digitization, etc.), and they have been extremely helpful. I have used that information a lot. (Randi*, WLC, interview, pp. 1-2)

The English department also held *in-house* workshops that were either generic Moodle workshops or customized ones that were tailored to the needs of specific programs (i.e. IEP and ITA). In this regard, Adam stated that he led three workshops during a semester to teach different functionalities of Moodle. Bethany also mentioned

how the former Moodle administrator conducted a customized workshop just for the IEP teachers.

Sally stated that although she found some workshops helpful, most of the time they were not as useful for her because she did not end up using the things they taught at the workshop. She either already knew how to use the tools introduced in the workshop, or did not see value in using them. For example, she said:

> One of them having an assignment where students can record something and you can record a response. I think I was already doing that. And so I did not really need that information. And another part of it was with using a, using some features of Moodle that I just did not feel I needed. (Sally, ITA, interview, p. 8)

These workshops appeared to be more beneficial when there was a shared point of interest. For example, Mike highlighted one such workshop that focused on using films in language classrooms. Since there were a group of teachers who were interested in films, this custom tailored workshop benefited them as a group. Mike remarked:

> We did have one workshop that I remember where faculty who are teaching film classes shared some of their approaches to presenting film clips and digitized film clips, how they were used in classes, how students could analyze them, how they put them on the website. There are also copyright issues that are involved any time that you know you will be using media in class or online and it makes sense to discuss some of those issues. That was, I think, particularly useful because it was a group of people who all taught film. (Mike, WLC, interview, p. 9)

The findings also indicated that administrators and technical and pedagogical support personnel tried to identify areas of need to select workshop topics. In this regard, Jade mentioned that he received a survey that asked what they wanted to learn about involving technology. He stated, “So you can pick the stuff and they pick the most voted thing to give a workshop about. So, this kind of support is really helpful” (Jade*, ITA, interview, p. 11). Bethany also mentioned how her professional development team surveyed the staff to find out what teachers were interested in learning about; technology was one topic listed. Samantha added that she was planning to create a survey to identify the areas of need so that she could organize needs-based workshops.

Another professional development activity for teachers that emerged was an informal *brown bag* meeting that was held in the Department of World Languages and Cultures on a monthly basis. Susan explained these meetings:

> They have mostly been in the computer classroom and basically somebody who has been using technology in an innovative way will give a demonstration. [LSRC director] and that instructor presents, demonstrates the technology as well as, you know, maybe provides handouts or copies (like of the actual activity) of how that technology was used in this project. So, sort of like an information sharing or information gathering session. And then, certainly, more informally, colleagues using the same or other technology will share ideas with each other, or function as another’s sounding board. So, part demonstration presentation, part discussion, information sharing and then sort of part like brainstorming and troubleshooting together. (Susan*, WLC, interview, p. 11)

Susan also added that these meetings were not required for faculty members. Thus, participation was not high because faculty members were busy with other responsibilities. Susan commented:

> I think, really since the economic crisis, current circumstances have been really stretching people beyond their typical load or requiring that they do more in their courses or in the department service-wise. So, the last couple of years, people have been teaching extra classes or seeing more students in their classes which adds to the work load (especially in terms of grading) … And so, with reductions in staff and available funds, we have not had the budget that we have had for these kinds of events … So, I would say that it has been probably at least two years since we had the last one. (Susan*, WLC, interview, p. 11)

A final professional development activity that has been tried in IEP and recommended in WLC was to use a portion of the faculty meeting as a show and tell where teachers could give a brief presentation about a specific technology or an activity that worked for them. For example, Bethany indicated that they spent 10 minutes where one of the teachers shared a teaching tip (Bethany, IEP, interview, p. 6). Likewise, Samantha stated that she received a similar request from a teacher:

> There is one teacher who I recently talked to, who said it would be really neat if, because she knew that I was really into professional development, really neat if at every faculty meeting, I did like a one minute tech tip. So each month just show them one new thing that or one thing that you know a lot of people have said that they kind of want to learn a little bit more. Just do a really brief, this is

> what it is, this is what it can do, if you want more information, you can come and see me. (Samantha, WLC, interview, p. 7)

Therefore, the results indicated that taking advantage of faculty meetings could be a good opportunity to increase awareness of available technological resources and how they could be used to enhance language learning and teaching. If it is something that teachers are interested in, they can seek further guidance and assistance.

Overall, professional development opportunities in technology use and integration included conferences, workshops, brown bag meetings, and show and tell during faculty meetings. The results indicated that some of these activities (e.g. brown bag meetings, show and tell during faculty meetings) had been tried in the past but not sustained for one reason or another. Conferences and workshops seemed to be more effective because teachers specifically referred to those when they were asked about where they learned about technologies that they could use in their instruction.

To summarize, the ecosystem-level factors identified language teachers' technology use and integration in this study were *access to technology*, *funding opportunities, administrative support*, and *professional development*. With that in mind, the discussion now turns to the last research question, which delved into teacher-ecosystem interaction and how it impacted university-level language teachers' technology use and integration.

Research Question 3: Teacher-Ecosystem Interaction

The ecological perspective claims that species in an ecosystem is in a constant interaction with other species as well as the other members of their own species (Zhao,

2003). When applied to school ecosystem, this can imply that teachers' overall technology use might be impacted by their interaction with other species of the school ecosystem (e.g. students, technical and pedagogical support personnel) or other members of their own species (i.e. other teachers). The third research question in this study examined teacher-ecosystem interaction to identify how this interaction impacted university-level language teachers' technology use and integration. Therefore, the third research question is stated as, "How does teacher-ecosystem interaction impact university-level language teachers' technology use or non-use?" The analysis of the data indicated that *student characteristics*, *peer interaction*, *inter-departmental collaboration*, and *technical support* were the factors that emerged through teachers' interaction with the ecosystem to which they belong. In the next section, each of these factors will be reported.

Student Characteristics

Teachers' interactions with students indicated that student characteristics played a major role in university-level language teachers' technology use and integration. Teachers that participated in this study indicated that students seemed to expect them to use technology, but there were a few instances where they quit using certain technologies based on student feedback. Teachers also mentioned that students were using so much technology in their daily lives that they expected to see it used in instruction as well. For example, Susan stated:

> I think students are expecting technology. I am not exactly sure what is going on at the secondary level, but in their daily life, they are using so much technology

> and so much is online that I think that they expect to be using technology as part of your class. I think it also, in their eyes, makes the information that you are trying to teach them seem more relevant to them in their lives. (Susan*, WLC, interview, p. 8)

Susan further commented that she heard that students had complained about some teachers not using technology:

> I have heard cases where students have complained, like in their evaluations, about certain teachers not using technology. And then that has been noted in your performance evaluation with the chair. And there have been instances supposedly where faculty has been told, "you should adopt more technology." As I view it, and understand it, this is kind of seen more as a reaction to students not getting what they feel they should be getting in their education, which would be technology in this instance. (Susan*, WLC, interview, pp. 11-12)

The findings also indicated that when teachers used technology, they felt more connected to students. Likewise, Kate felt there would be a generation gap between her and her students if she did not use technology:

> It is the students. That is the reason. Students are so much with technology that if I do not use technology, I feel like I am grandma. And I do not want to be a grandma. So, it is basically because of the students, because they are using it all the time. (Kate*, WLC, interview, p. 2)

The results also implied that some teachers started using certain technologies because of the pressure they felt from students. For example, Randi mentioned how she

started using online gradebooks because students frequently asked what their grades were on their assignments that had already been returned to them. She stated that students were so used to seeing all their grades online in when they were in high school that they expected the same thing in college.

The pressure felt from students seemed to be forcing even the teachers who used technology less to integrate certain types of technologies. For example, Kyle stated that he started using a course management system (CMS) because students needed some kind of a reference or communication of the course expectations:

> It was probably just an accident having a certain cohort one year that did not pay attention [to] what I told them what to do at the end of class. And I felt that all of a sudden all good happens. Instead of getting a 95% response rate when I give them oral assignment in class, I was getting 80% or 75% response rate. I thought well, OK, I know what my colleagues say, you know students just do not listen anymore. Part of this is also related to the fact that I teach a self-selected cohort of students. The German students are highly self-selected. They would not come and do it, if they did not really choose to. So, all of a sudden I felt like I needed to do something different. And the CMS is there. Most of them use it everyday. And I thought, great. (Kyle, WLC, interview, p. 11)

Overall, students' expectations of seeing technology used in their classes motivated, or even at times seemed to force teachers to integrate technology. However, the results also indicated that students might discourage teachers from using certain

technologies. For example, Susan commented that students did not like using innovative technology. Susan remarked:

> If it [technology] is too progressive, if it is too much they do not like it. They still want the traditional to some extent, like some of those aspects of traditional classroom instruction, in other words, traditional approaches but enhanced with technology. (Susan*, WLC, interview, pp. 12-13)

Another example of this is illustrated when Kate stopped using Second Life in her class based on the feedback she received from students. She said:

> For me, it was fascinating, wow look at this… but some students, they do not, they do not like it, Second Life, because first you have to train them. We spend like two classes teaching them, how to use Second Life. We give them activities. But for them, it is like they are losing their time. They are not learning Spanish, they are learning technology and they do not want that. So right now, I am not using Second Life because of some of the comments. (Kate*, WLC, interview, p. 9)

Another student characteristic, their language proficiency level, did not seem to have much impact on teachers' decisions about using technology. They indicated that no matter what language proficiency level they were teaching they tried to use similar technologies most of the time. However, Susan mentioned how it might change depending on the nature of technology:

> Like tele-collaborative exchanges [are] much easier at the advanced level… I mean because they do not have the language skills or proficiency yet to engage

> easily in sustained conversation in the first year. So, definitely in terms of tele-collaborative kinds of exchanges, synchronous, asynchronous, like Skype or Wimba VoiceBoard, and other software of that nature. Yeah, I definitely, I do not use them in the first year. Second year, I think yeah. You can start to use those kinds of tools but I think it is definitely easier in the advanced level. Otherwise, I would say by and large, I use very similar technologies across all levels. (Susan*, WLC, interview, p. 15)

In sum, students' expectations of seeing some kind of technology integrated into instruction seemed to impact even those teachers using technology on a limited basis by forcing them to adopt certain instructional technologies. However, the results also indicated that students did not want to spend too much time on learning technology during the time that they should be learning the language. Another teacher-ecosystem interaction factor, peer interaction, will be reported next.

Peer Interaction

Peer interaction seemed to impact some teachers' technology use, particularly when they shared an office in which they had more opportunities to talk about what they did in their classrooms. In this regard, Sammy and Ally stated that they got several technology-assisted activity ideas from their officemates. Sammy indicated that sharing an office with colleagues who were interested in technology was helpful, as she stated:

> Couple of teachers, who are not here anymore, who are really up on technology and talking to them was really helpful. They were both here in this office. So, we were just, you know, what are you doing? Asking questions. Yeah, that [sharing

> an office] has helped a lot. Because, you know, they are over there doing their work but you can bug them. (Sammy*, IEP, interview, p. 9)

Ally also indicated that other people who were doing research and test development in technology and language learning were "always on the look out for other resources too that are good quality and are easy to access. I think those connections [with peers] are really important" (Ally*, ITA, interview, p. 5). She then gave an example of how she learned about TED talks, which she used in her classes, from her officemate.

Not all the teachers in this study shared offices like Ally and Sammy. However, the results indicated that some still were in communication with their colleagues especially when they had issues with technology. For example, Sally gave an example of how she e-mailed her colleague when she could not upload her student video recordings. She stated, "So, last week when I could not upload my files, I e-mailed [another teacher] and said, hey what are you doing with your files" (Sally, ITA, interview, pp. 8-9)? This example was confirmed by the technical and pedagogical support personnel, Adam, who also mentioned that many teachers helped each other so they did not need as much help from him (Adam, IEP/ITA, interview, p. 4).

Overall, the results indicated that teachers' interaction with their peers contributed to their technology use and integration. In particular, they exchanged ideas about the kinds of technologies that they could use in their teaching, and how they could troubleshoot technical issues they encountered. To that end, the discussion turns

to how teachers used *technology support* to enhance their teaching with the use of technology.

Technical and Pedagogical Support

Teachers in this study had access to *technical and pedagogical support* both at the university and departmental or program level. Technology support appeared to be a necessary component to foster successful technology use and integration according to the teachers in this study. Campus-wide support for instructional technology was provided through the Center for Excellence in Learning and Teaching (CELT) at the university. At the departmental level, WLC had the LSRC director who provided technical and pedagogical support to faculty members in using technologies to facilitate language instruction. The ITA program and IEP had an instructional technology coordinator who provided support mainly for Moodle. Finally, the IEP had a language lab coordinator who ran the language lab. More detailed information about these technical and pedagogical support personnel can be found in chapter three. Several of the teachers commented on how invaluable these individuals and support structures were in helping them use and integrate technology.

At the university level, CELT provides faculty, staff, and graduate teaching assistants with numerous resources related to effective teaching and learning. In particular, the learning technologies group provides workshops and forums, individual and group consultation, and provide[s] primary support for Blackboard Learn, clickers, Class Climate—course evaluation system—and emerging technologies such as social

networking, online communication and presentation, and virtual worlds. (CELT, Support for Teachers and Instructional Designers, 2011)

Susan, Kate, and Randi, WLC stated that CELT was one of the resources that they had turned to when learning about different technologies they could use in their instruction. For example, Susan remarked that she had attended many CELT workshops. In fact, she had even presented some of her technology ideas during some of the CELT forums (Susan*, WLC, interview, pp. 10-11). In addition, Randi said that she became aware of clickers because of the e-mails she received from CELT. Randi was particularly happy with this kind of centralized support because technical problems would be addressed sooner rather than later, and she could receive help even on the phone. Randi added that she chose Blackboard as her course management system because she needed the technical support. She stated, “if a technology is going to be unsupported then I would not use it” (Randi*, WLC, interview, p. 20).

At the departmental level, WLC teachers kept referring to the former LSRC director both as both a source of information and a source of support. The current LSRC director had just recently started her position, so she was still trying to learn the position and had not yet begun working with individual teachers when this study was conducted. Working with the former LSRC director was a common theme that emerged when the WLC teachers were asked about what kind of support they had in their organization. Mike, the WLC administrator, also emphasized that the LSRC director usually provided one-on-one help and collaborated with teachers on special projects which teachers found really helpful. For example, Susan stated:

> We definitely always have a curriculum and technology specialist [LSRC director] with whom we can make appointments … here is what I would like students to do, what do I need technology-wise, you know, to help students succeed in this project or activity. (Susan*, WLC, interview, p. 10)

Kate also repeatedly remarked that she learned a lot from the former LSRC director. She said:

> Actually, I am missing him [the former LSRC director] here for this. Because he was the one who really was teaching us everything with technology. When I was, like two years ago, I was also in this [technology] committee and it was good because, with him, we were learning a lot. He brings all these new materials and we were, yeah, yeah, how do we use it? (Kate*, WLC, interview, p. 5)

Overall, the WLC teachers seemed to appreciate the help they received both at the university and at the departmental level as Randi summarized: “I feel really lucky in terms of the tech support and the tech opportunities I have had here. Because otherwise, I certainly would not be doing what I do” (Randi*, WLC, interview, p. 15). Even Kyle, who did not use much technology in his teaching, admitted that they had a lot of support and resources available.

The IEP and ITA teachers had access to an instructional technology coordinator, Adam, who mainly administered Moodle for the English department. In terms of supporting teachers in the use of Moodle, Adam provides workshops and individual support as needed. All the ITA teachers had a Moodle page for their classes and they seemed comfortable with the help they received. For example, Ally stated:

> If I have questions about whether Moodle can do a certain [task] or if I want to group students in a certain way or whatever, then, you know we have a department person [Adam] who works with that. (Ally*, ITA, interview, p. 5)

Sammy, on the other hand, stated that she did not need any support because she liked figuring things out on her own. Along the same lines, Adam remarked, “I think in terms of technology, our ESL, our Applied Linguistics and our IEP teachers need less technical support” (Adam, IEP/ITA, interview, p. 3).

Adam also mentioned that the IEP teachers might not be aware of some support that he has disseminated through e-mail, because he recently found out that the mailing list he used to communicate did not include the IEP teachers. He emphasized that he needed to take action to make the support more visible when he stated:

> So they haven't been getting messages for, I don't know, years. Very important messages that sort of like reiterates some basic concepts like, this is who you go to for help. Even if they just got that, that would be an advantage … I am not sure that information is being disseminated effectively. I'd love to find a way to meet with the right people in IEP and TESL and start some kind of, make some inroads, in that group to let people know what kind of support they have. (Adam, IEP/ITA, interview, p. 6)

Dave, the language lab coordinator, was another technical and pedagogical support person in the IEP. However, Dave's role did not include providing one-on-one help to the teachers in using and integrating technology. Rather, he made sure the lab was run smoothly and the equipment functioned properly. In this regard, as stated

earlier, Bethany mentioned that she was planning to hire someone with a background in technology who could both teach at the IEP and provide technological and pedagogical support for teachers, which might affect teachers' technology use in the long run.

The ITA program did not have a dedicated technical and pedagogical support person. They appeared to address issues on their own, or they talked to ITA administrator or assistant like Ally mentioned, "If I have questions about the software that is in the pronunciation lab, I could just talk to Erica or Jade … Jade and Erica would be the people to help me with that" (Ally*, ITA, interview, p. 5).

Overall, the findings indicated that teachers had access to technical and pedagogical support both at the university and department or program level. This support ranged from making sure the equipment functioned properly to supporting teachers in technology use and integration. However, whether to seek after help or not was still a choice that a teacher needed to make. Next, how *inter-departmental collaboration* contributed to technology use and integration will be presented.

Inter-departmental Collaboration

Another factor emerged in this study that impacted language teachers' technology use was *inter-departmental collaboration*. For example, Susan, a WLC instructor, emphasized that in the past she had received help from graduate students who were working on their technology practicum in Applied Linguistics and Technology (ALT) program. In this regard, Bethany stated how she was glad that IEP worked in cooperation with Curriculum and Instruction (CI) and ALT, and she wished there were more collaboration among the programs on campus (Bethany, IEP, interview, p. 13). She

explained how a graduate student from CI initiated a blended learning project as part of his dissertation in IEP, and the IEP teachers continued doing blended learning even after the graduate student was done with the project. She said:

> We often get request[s] from ALT people [and] CI students who want to do a project in one of the IEP classes… [a graduate student from CI] did a module … a few years ago and it involved blended learning. And what was very nice about it was that [the CI graduate student] worked with a group of teachers and you know set up the lesson and that got people into blended learning. Well then his project ended … The next semester, there were teachers who were interested in blended learning and the teachers who worked with the graduate student got another group of teachers who were interested in blended learning, and they went off. So, we have some teachers [training other teachers to do] who are doing blended learning classes. (Bethany, IEP, interview, p. 6)

Sammy was one of those teachers who became interested in blended learning and ran her lab days synchronously on a course management system by having her students do online activities.

Ally, a teacher in the ITA program, also commented that she wanted to know more about what teachers in the WLC program were doing. She stated that there was not much communication between ALT and WLC, which she found odd, and she recommended that joint efforts for professional development opportunities might contribute to further technology use. Ally stated:

> I wish I knew more I guess what the other teachers were doing like in World Languages. That would be nice to see what they are doing. And since they usually teach in [building name] and now speaking classes anyway are over in [building name]. It would just be nice to hear what they do with technologies especially. (Ally*, ITA, interview, p. 10)

Along the same lines, Randi indicated that she did not have much connection with people from other departments even though her department might "have a lot of things in common with ALT, with CI, with English" (Randi*, WLC, interview, p. 6). She emphasized that there was no mechanism to facilitate such connection among the departments when she said:

> I do not know much, to be honest, what you do in Curriculum and Instruction and the technology portions of that. That would probably be really useful to me in what I do. But there are not a lot of mechanisms to get that knowledge to me, to circulate that knowledge easily around the university. (Randi*, WLC, interview, p. 14)

Overall, the results indicated that *inter-departmental collaboration* might positively impact teachers' technology use and integration. However, this type of collaboration appeared rather limited. Therefore, teachers in this study hoped for more communication among the different departments and more joint efforts that might help university-level language teachers raise awareness about what others were doing that they could also do.

In sum, teachers' interaction with the ecosystem to which they belong seemed to impact their technology use and integration. In particular, their interaction with their students, their *peers*, their interaction with the *technical and pedagogical support personnel,* and their *colleagues across colleges* seemed to impact the ways and the extent of technology use and integration.

Chapter Summary

This chapter presented the results concerning the factors impacting university-level language teachers' technology use and integration. In particular, teacher-level factors, the ecosystem-level factors, how teacher-ecosystem interaction contributed to university-level language teachers' technology use and integration were all addressed.

The findings indicated that teacher-level factors impacting university-level language teachers' technology use were teachers' *beliefs about the role of technology, daily technology use, technical skills, training in technology*, and *professional/research interests.* Ecosystem-level factors impacting the technology use of university-level language teachers included *access to technology*, *funding opportunities*, *administrative support*, and *professional development*. Finally, how teacher-ecosystem interaction impacted university-level language teachers' technology and integration was examined. The results indicated that *student characteristics*, *peer interaction, technical support*, and *departmental collaboration* contributed to successful technology use in a university-level language teaching environment.

The next chapter discusses the findings presented in this chapter and presents the limitations of the study. In addition, the practical implications for language teachers,

language programs and language teacher preparation programs are discussed as are the theoretical implications for researching factors impacting language teachers' technology use and integration. Lastly, concluding remarks round off the chapter.

CHAPTER 5: DISCUSSION

In this chapter a discussion of the results for this study will be presented. The discussion is divided into eleven sections: 1) a brief summary of the study; 2) an examination of the teacher-level factors impacting university-level language teachers' technology use and integration; 3) an examination of the ecosystem-level factors impacting university-level language teachers' technology use and integration 4) an exploration of the impacts of teacher-ecosystem interaction on university-level language teachers' technology use and integration; 5) a summary of the conclusions; 6) an outline of the limitations of this study; 7) an exploration of the implications for language programs; 8) an exploration of implications for language teacher preparation programs 9) an exploration of the theoretical implications of this study, 10) a discussion of directions for future research; and 11) concluding remarks.

Summary of the Study

Developments in computer and communication technologies over the last decade have provided exciting opportunities for language teaching and learning. Today, language learners have the ability to interact instantaneously with native speakers or other language learners and they can access a large variety of target language resources and a variety of input. The exponential growth in the number of opportunities provided by faster computers and Internet connections have also forced universities and colleges to invest in technologies that have opened up new instructional possibilities in classrooms.

Despite the gradual growth in the use of digital technologies by language teachers over the last fifteen years, integration of technology into language classroom pedagogy still seems to be fairly limited (Guichon & Hauck, 2011) and *normalization*–the stage wherein technology is so embedded in a teacher's everyday practices that it is almost invisible–does not seem to have yet occurred (Bax, 2003). This raised the question: what hinders and/or encourages language teachers to pursue a technology-enhanced pedagogy that will equip their students with the necessary skill set to function in the target language they are learning?

This study sought to accomplish three main goals in its investigation of the factors impacting university-level language teachers' technology use and integration. The first goal was to identify teacher-level factors impacting university-level language teachers' decisions and practices of technology use. The second goal was to identify ecosystem-level factors impacting university-level language teachers' technology use and integration. Finally, how teacher-ecosystem interaction impacted university-level language teachers' technology use and integration was analyzed.

Two main bodies of research were tapped in the pursuit of these goals: 1) research on barriers and contributing factors to successful technology use and integration in instructional technology; and 2) research on barriers and contributing factors in the use of Computer Assisted Language Learning (CALL). In addition, research on the impact of individual factors (e.g. pedagogical beliefs, training in technology) on technology use and integration both in instructional technology and CALL was reviewed.

This study was designed to contribute to the existing body of knowledge in each of these areas.

This study applies and uses Zhao and Frank's (2003) *ecological perspective* and Davis' (2008; in press) *co-evolutionary perspective* to examine the factors impacting teachers' technology use or non-use. Analyzing the factors from an ecological perspective enables researchers to examine how various factors interact with each other and influence teachers' overall technology use and integration. Research on factors impacting language teachers' technology use is addressed by focusing on a university-level language teaching context. Thus, teacher-level and ecosystem-level factors, as well as how teacher-ecosystem interaction impact overall technology use are all investigated and discussed. This provides valuable information about what language programs and language teacher preparation programs (e.g. TESOL programs, World Language teacher preparation programs) can do to eliminate barriers that limit technology use and integration, and offers suggestions on how to create opportunities for language teachers to facilitate successful technology use. Thus, the results of this study supported some findings from previous research, contradicted some others, and revealed additional factors that have not been identified in previous literature.

In order to investigate the factors impacting university-level language teachers' technology use and integration, three administrators, three technical and pedagogical support personnel and eight teachers participated in this study. Data collection started with interviewing the administrators in the language teaching programs. These administrators were then asked to nominate two exemplary technology-using teachers

and two teachers whose technology use was more limited. Although the administrators were able to easily nominate exemplary technology-using teachers, they had some difficulty in nominating limited technology-using teachers. Therefore, out of the eight teachers who volunteered to participate in the study, six were identified as exemplary technology-using teachers, while the other two were identified as individuals who used technology to a lesser extent compared to the other teachers in their program. A technical and pedagogical support person from each language teaching unit participated in the study.

All the participants were interviewed using a semi-structured interview protocol, which was prepared based on the findings from previous research. These interviews were all recorded and transcribed verbatim for analysis. Additional data sources included classroom observations of five teachers, and field observations. To ensure the interpretations were accurate representations of the participants' statements, the researcher did a member checking. This member checking included sending each participant a document with excerpts from the interview transcriptions that were included in the findings. The participants were asked to edit their quotes to clarify points, if necessary, but without changing the meaning. Of the fourteen participants, five made some corrections, five approved the excerpts as they were, and four did not respond to the email. The analysis followed the qualitative data analysis guidelines and the coding procedures outlined in Ritchie, Spencer and O'Connor (2003). This included three main steps: data management, descriptive accounts and explanatory accounts.

Findings from this study were reported in Chapter 4. These results will now be discussed in relation to findings from previous research.

University-level Language Teaching Ecosystem

As stated earlier, Zhao and Frank's ecological perspective, and Davis' (2008, 2011) co-evolutionary perspective provided the theoretical background for this study. However, both of these perspectives were based on the K-12 educational system. The results of this study describe a higher-education ecosystem that has both similarities and differences with the previous perspectives. The findings from this study revealed an ecosystem that describes the factors impacting university-level language teachers' technology use and integration (See Figure 6).

Just like a K-12 classroom, a university language classroom, with its biotic (e.g. teachers and students) and abiotic components (e.g. physical setting, language skill area) is considered as the lowest-level component of the ecological hierarchy. The hierarchical nesting, however, is not as clear as it is in the K-12 schooling system, where the ecological perspective was initially implemented. The three research units included in this study have rather different hierarchical systems. World Languages and Cultures is a department nested within the College of Liberal Arts and Sciences, and then the university. The International Teaching Assistants program is nested directly within the Graduate College, and then the university. The Intensive English Program is nested within the Department of English, within College of Liberal Arts and Sciences, and then the university. The dotted lines in Figure 6 represent these "fuzzy" areas where the

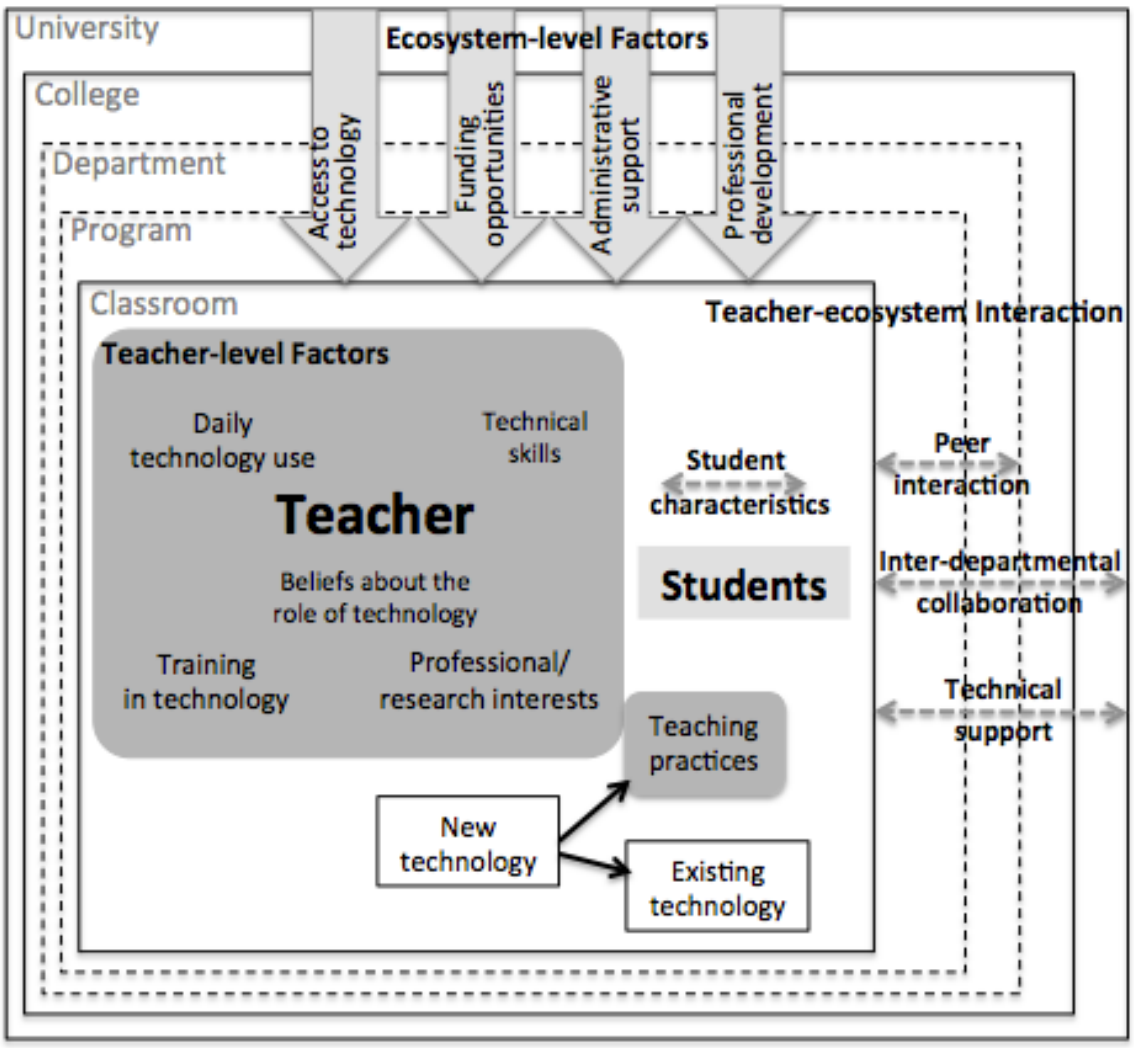

Figure 6. A language-teaching ecosystem in a higher education context

research units vary from each other. Additionally, these programs and the department behave rather autonomously even though they are nested within different hierarchical levels.

As the keystone species, teachers determine the level and extent of technology use in the language classroom (Davis, 2008; 2011; Zhao & Frank, 2003). The agency of language teachers is even stronger in university level teaching compared to K-12 schools since university-level teachers have more freedom about what to teach and how to

teach it. The only evaluation that would hold them accountable for their teaching—especially after tenure—is the end-of-semester feedback provided by students.

The results from this study indicated that teachers' *beliefs about the role of technology*, *daily technology use*, *technical skills*, *training in technology*, and *professional/research interests* played a role in the level and extent of the technology use and integration in language classrooms at the university level. This explains the reasons why some teachers use and integrate technology while some others do not even though they are the members of the very same ecosystem. For example, all four WLC teachers have access to the same kinds of resources and support systems, but there is one teacher who just prefers to use technology in his teaching as minimally as possible.

As the keystone species, teachers also interacted with other members of the university ecosystem—e.g. students, administrators, technical and pedagogical support personnel. This interaction occasionally resulted in teachers' revamping their existing practices or adopting new ones as Davis' co-evolutionary perspective suggests (Davis, in press). For example, one of the limited technology-using teachers, Kyle adopted a course management system as a result of his interaction with students. In other words, change in the characteristics of student population enforced him to start using technology in his teaching. For another example, Sammy, one IEP teacher began using blended learning activities after her interaction with a colleague.

Ecosystem level factors at different hierarchical levels of the university ecosystem such as *access to technology*, *funding opportunities, administrative support,*

and *professional development* were found to impact university-level language teachers' technology use and integration. The department or program administrators, as the closest hierarchical level to the immediate context of teachers, are more likely to have one-on-one interaction with teachers. Therefore, they can provide leadership and provide guidance about technology use and integration. The higher-level components of the ecosystem (i.e. college, university) also play a major role in providing the resources (e.g. access to technology) and support (i.e. funding opportunities, professional development) language teachers might need when they integrate technology into their teaching. Having described the university-level ecosystem, the first research question investigating the teacher-level factors will now be discussed.

Teacher-Level Factors

As stated earlier, teachers are considered to be the keystone species in the educational ecosystem, as they are the final decision makers about what happens in a classroom (Zhao, 2003; Davis, 2008; 2011). Evidently, teacher characteristics play a major role in technology use as it pertains to language instruction. In particular, teachers' *beliefs about the role of technology, daily technology use, technical skills, training in technology*, and *professional/research interests*, appeared to impact university-level language teachers' technology use and integration (See Figure 7). Each of these characteristics is addressed further as the teacher-level factors are discussed.

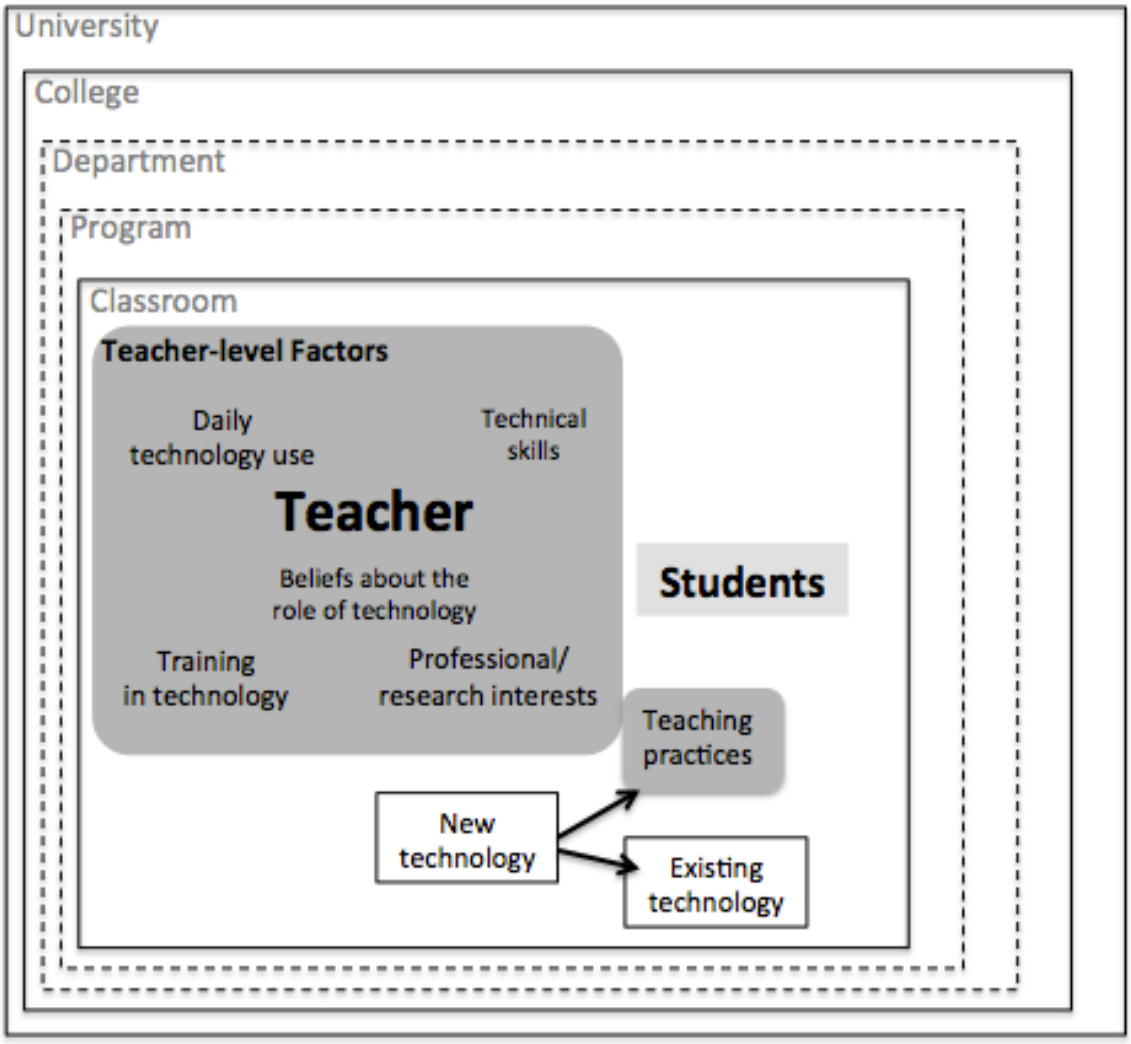

Figure 7. Teacher-level factors in a language teaching ecosystem in higher-education context

Teachers' Beliefs about the Role of Technology

One major factor determining the level and the type of technology use by language teachers in this study was, in fact, the teachers' beliefs about the role of technology in language teaching. The results from this study indicated that if language teachers believed that technology would add any value to their teaching, they were more likely to use and integrate it. In other words, teachers had to believe that what

they were doing in the classroom had merit before they were likely to give wholehearted support (Owston, 2007).

The technology-using language teachers valued technology as an effective teaching tool to enhance their teaching. They believed that technology served to meet their learning objectives, and they stated they could do things that could not be done without technology (Stockwell, 2007). It appeared that the more strongly teachers believed that computers were compatible with their particular teaching styles, the more often they reported using computers for both organizing teaching and using these tools with students in innovative ways (Ertmer, 2005; Owston, 2007; Zhao & Frank, 2003). In particular, the findings from this study indicated that technology-using university-level language teachers believed that technology was pedagogically useful for four reasons: *extending learning beyond the classroom*, *providing visual enhancement*, *providing opportunities for authentic language input and output,* and *implicitly teaching additional skills*.

In terms of *extending learning beyond the classroom*, teachers believed that they could take some tasks that require individual practice (e.g. grammar revision exercises, pronunciation exercises), which would allow extra time for other activities in class such as discussions (Baek et al., 2008). For example, some ITA teachers mentioned how they used computer-aided pronunciation training software outside of class to motivate and raise awareness of individual difficulties (Levy, 2009). This kind of pronunciation software was found to help learners improve their pronunciation and speaking competence (Chun, 2008).

Language teachers that participated in this study also commented that technology helped them provide *visual enhancement* to the material that they were teaching. In particular, they tried to present the target language in multiple forms (e.g. audio, visual and text) especially because they used the target language in class all the time. The visuals help students to associate meaning to the language they hear, and "multimedia presentations can create stronger memory links than a single medium alone" (Zhao, 2003; pp. 13-14).

The results from this study also indicated that teachers used certain technologies to provide authentic input and opportunities for output. Access and exposure to authentic and comprehensible input is deemed to be essential for successful language learning. Technology, and the Internet technology in particular, enables learners to access natural, context-rich linguistic and cultural materials in the target language (Zhao, 2003). Language teachers that participated in this study appeared to utilize authentic materials such as videos, lecture recordings, and text-based Internet resources in their instruction.

Finally, some language teachers that participated in this study argued that they were teaching some *additional skills* when they used technology in their instruction such as self-responsibility and media literacy skills (Hafner, 2011). These teachers commented that they were contributing to their students' skill acquisition, which could potentially help them in other areas of their lives, by using technology in their instruction (Felix, 2005; Lotherington & Jenson, 2011).

Overall, technology-using language teachers that participated in this study believed that technology was pedagogically useful to meet certain learning goals and objectives. Specifically, these teachers believed that technology was helpful for *saving class time*, *providing visual enhancement*, *providing opportunities for authentic language input and output,* and *implicitly teaching additional skills*. That said, the discussion now turns to the next teacher-level factor, daily technology use.

Daily Technology Use

Findings from this study indicated that participants' technology use in their daily lives had some impact on their technology use for teaching. That is to say, language teachers who enjoyed using technology in their daily lives (e.g. Susan, Kate, Sammy) appeared more willing to try out different types of technologies while teaching. If they did not use technology much in their personal lives (e.g. Kyle) they were more reluctant to adopt certain technologies for teaching. These findings support similar results from researchers such as Osika et al. (2009) and Wozney et al. (2006) who found daily computer use as a strong predictor of classroom technology use. Thus, as this study found, the daily use of technology seemed to play an important role in university-level language teachers' technology use and integration.

It is worth noting that prior research also cautions against teachers with high technical skills being caught in the 'coolness' of technology and suggests that they use it just for the sake of technology rather than to serve a pedagogical goal (Boyler & Ritchie, 2002). This was not a concern for teachers who participated in this study as they indicated that they started with a pedagogical aim and then found the technology that

would best serve that instructional purpose. Thus, pedagogy drove the technology, not vice-versa. The value of technology for education was proportional to the need for that technology in realizing educational objectives as also suggested by Gibson (2001). The next teacher-level factor, technical skills, is now discussed.

Technical Skills

Many of the teachers in this study considered themselves 'moderate' users in terms of technology proficiency. This indicated that language teachers did not need advanced *technical skills* to successfully use and integrate technology. However, it appeared that having at least a moderate level of proficiency in technical skills was important, and it streamlined the technology integration process (Becker, 2000; Hermans et al., 2008; Papanastasiou & Angeli, 2008). In particular, having the skills to troubleshoot simple hardware and software issues appeared to contribute to overall technology use and integration in language teaching at the university level. The next teacher-level factor, training in technology, is now discussed.

Training in Technology

The results of this study indicated that training in technology seemed to be contributing to successful technology use in language teaching. Chen (2008b) also reported that teachers who had a degree in a technology- related area were better able integrate technology into their teaching. However, it is important to note that in this study, participants who lacked training (e.g. Susan, Randi) still tried to use and integrate technology into their classes. If they believed technology would contribute to their teaching, they found ways—i.e. technical and pedagogical support personnel, peers, and

workshops—to learn about what was available to them that would support their instruction. This dovetailed well with previous findings that personal exigency, rather than formal training, was a better determiner of teachers' technology use and integration (Egbert et al., 2002; Kessler, 2007). The next teacher-level factor, professional/research interests, is discussed next.

Professional/Research Interests

The results of this study revealed that *professional/research interests* was a factor that impacted university-level language teachers' technology use and integration. Language teachers who held a tenure-track position at a research-based university—like the university in this study—are required to conduct research and publish articles to ensure the continuity of their positions. In this study, it was determined that if the teachers' research and publishing interests were related to or included technology, they were more likely to use technology in their teaching. Therefore, linking technology use and retention, tenure, and promotion is likely to increase the level and extent of technology use in language teaching at higher education (Surry & Land, 2000).

These teachers appeared more adventurous in trying new technologies to test and evaluate how students' acquisition of the language was impacted. Because some of these teachers (e.g. Kate) were already publishing in this area, they were gaining something in return while providing technology-enhanced language learning experiences for their students. These teachers were also learning and becoming more aware of technologies that they could use in their teaching because they were attending regional, national, or international conferences on technology and language learning, as

well as presenting their own use of technology at such conferences. If technology in language teaching was not a research interest to teachers (e.g. Randi, Kyle), they were not taking advantage of these opportunities.

In sum, teacher-level factors that impacted university-level language teachers' technology use and integration included teacher's *beliefs about the role of technology* in language teaching, *daily technology use*, *technical skills*, *training in technology*, and *professional/research interests*. Among these teacher-level factors, teachers' *beliefs about the role of technology* in language teaching is central to their use or non-use of technology for instruction. It appeared that the more strongly teachers believed that computers were compatible with their particular teaching styles, the more often they reported using technology in their instruction (Ertmer, 2005; Owston, 2007). That being said, the discussion now turns to the ecosystem-level factors that impact university-level language teachers' technology use and integration.

Ecosystem-Level Factors

Results from this study indicated that the ecosystem-level factors that impacted university-level language teachers' technology use and integration were *access to technology*, *funding opportunities*, *administrative support*, *professional development*, and *student characteristics* (see Figure 8), each of which are discussed as follows.

Access to Technology

One common theme among the three research units was the administrators' statements about how almost every teacher in their organization used technology in one way or another. Although the extent and type of technology use ranged among

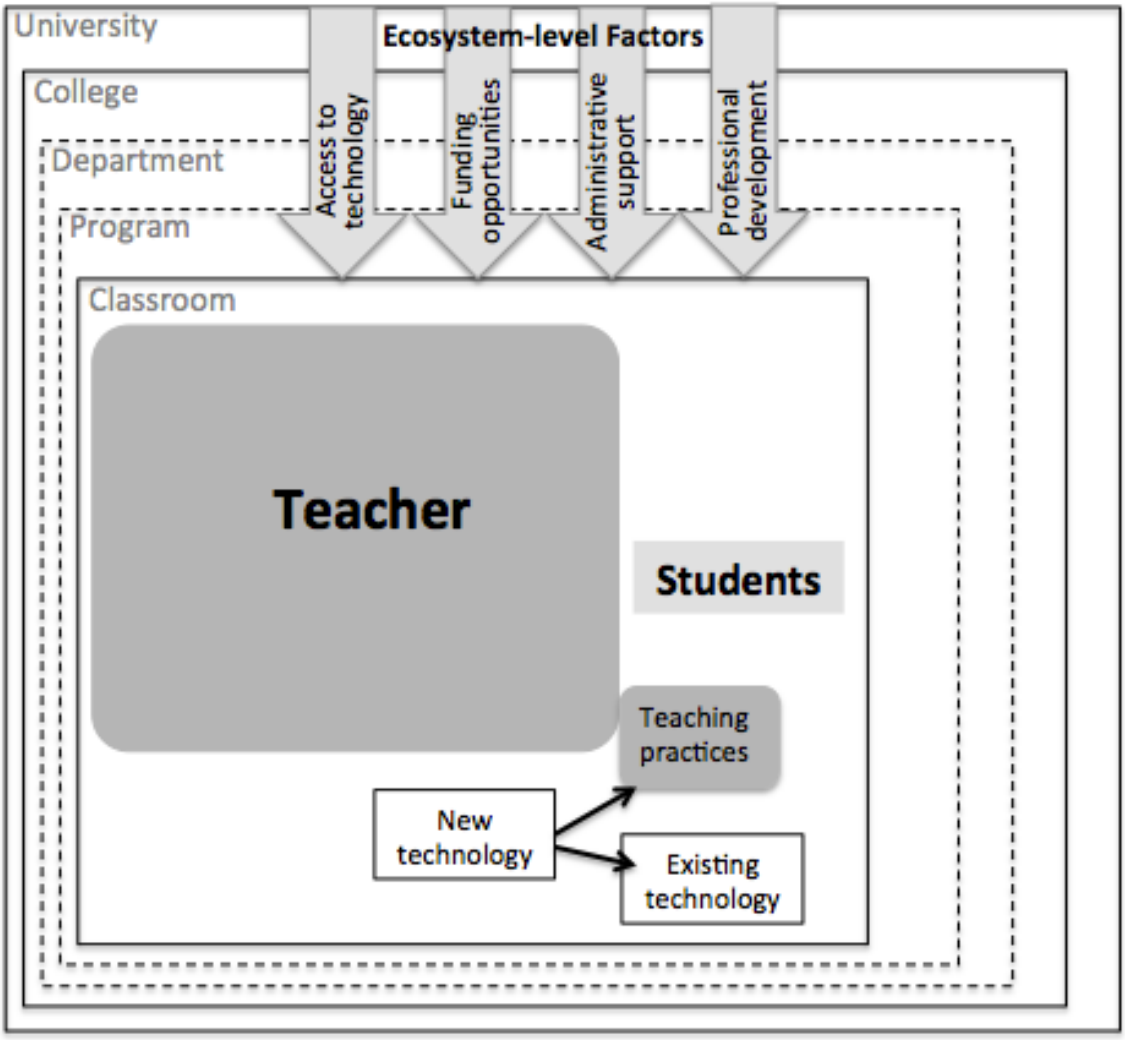

Figure 8. Ecosystem-level factors in a language teaching ecosystem in higher education context

teachers, each teacher included some technology component in their instruction, whether it was just using an online course management system to track student attendance, or assigning students to create technology-enhanced projects such as videos.

Easy access to technologies at the university, departmental and program level seemed to streamline the adoption of different digital technologies for instructional purposes. Language teachers in this study commented that they were provided with any

of the resources they needed in terms of technology and tools. These findings then implied that a university context, where teachers had access to resources and opportunities, could create an environment that was more conducive to technology use and integration. Previous research also concluded that the availability and ease of access to computers was directly impacting teachers' integration and sustainability of any pedagogical innovation (Inan & Lowther, 2010a).

On the other hand, several studies identified the lack of access to technology and resources as a barrier to technology in instruction (Ebsworth, Hutchison & Reinking, 2010; Kim and Klein, 2010; Wozney, Venkatesh, & Abrami, 2006). Along the same lines, results from this study reflect a similar finding from previous research: that removing an important barrier—i.e. lack of access to technology and resources—has the potential to contribute to technology use and integration, as well as the potential to motivate even the teachers on the limited end of the technology use spectrum. To illustrate this, we recall one of Kyle's comments about how he began using a course management system. He identified an issue in his teaching and figured that having access to and using a CMS would be a good solution to the problem, as he said, "So, all of a sudden I felt like I needed to do something different. And the CMS is there" (Kyle, WLC, interview, p. 11). Therefore, it can be summarized that, although access to technology does not always guarantee that it would be used by all of the teachers, the availability and ease of access to technology and resources seemed to be a contributing factor in university-level language teachers' technology use and integration. That said, the discussion must

include, and therefore now turns to the next ecosystem-level factor, funding opportunities.

Funding Opportunities

The findings in this study indicated that funding opportunities were critical in two major ways. First, having access to funding opportunities enabled administrators to provide the technical infrastructures needed for teaching. Second, funding opportunities provided teachers with additional financial assistance to design technology-enhanced activities.

Administrators in this study highlighted how they used university-wide or college-wide grant opportunities to purchase software and hardware to be used for instructional purposes. Existing funding opportunities at different layers of the ecosystem ensured that teachers had access to technologies that they needed for their particular teaching purposes. In other words, the university or college provided financial resources to acquire specific technologies that would meet an instructional goal, rather than handing down generic tools that might not necessarily serve the purposes of language teaching. For example, Erica used a university-wide grant to purchase pronunciation software which was a unique need of the ITA program. What is unique in this kind of grant process is that teachers themselves—rather than some educational authorities—decide what tool, software, or hardware they need to improve their teaching and to create effective language learning experiences for their students, and then they try to find available financial resources to support them.

By the same token, teachers needed financial support to hire people to help them with designing technology-enhanced activities. Kate, for example, benefited from grant funding that allowed her to hire a graduate assistant who could develop annotated readings and other online activities for her Spanish reading course. This implies that having access to software and hardware is not the only requirement for university-level language teachers. Rather, having access to additional funding opportunities to work on developing technology-enhanced materials appeared to contribute to their technology use and integration (Inan & Lowther, 2010a). The following is a discussion of another ecosystem-level factor, administrative support.

Administrative Support

The findings from this study indicated that the administrators who participated in this study had positive attitudes toward technology and were supportive of using technology to facilitate language learning and teaching. Therefore, they tried to do their best to support the teachers in their programs in technology use and integration by identifying and raising awareness about grant opportunities, providing feedback through annual evaluations and ensuring access to technology. Although many of the teachers that participated in this study did not explicitly acknowledge the role of administrative support in their technology use, the other factors they referred to as contributing factors to technology use and integration (i.e. funding sources, access to technology, technical support) might have implications for administrative support because the administrators generally took the lead in providing other resources. Such support from administrators has often been regarded as a critical component of the

sustainability of technology integration efforts (Al-Senaidi et al., 2009; Anderson & Dexter, 2000; Owston, 2007).

Overall, availability of administrative support seems to play a role in teachers' decisions and instructional practices involving technology. Administrators appeared to play a key role in seeking funding, offering incentives (i.e. extra stipend and/or release time), and providing resources needed for the sustainability of technology initiatives. Working in an educational environment, where administrators encourage technology use, is very likely to positively influence classroom use of technology. That being said, the discussion now turns to the last ecosystem-level factor, professional development.

Professional Development

Earlier studies indicated that professional development opportunities had some influence on teachers' technology use and integration (Y. L. Chen, 2008b; Inan & Lowther, 2010b; Yunus, 2007). Teachers in this study also engaged in a variety of professional development opportunities such as conferences, workshops, brown bag meetings, and faculty meetings. Most of these activities seemed to educate teachers about what was available to them that could use to enhance their teaching. In particular, using a portion of the faculty meeting time to teach a technology tip, showcasing sample technology uses in brown bag meetings, or attending a session at a conference all gives teachers ideas about what worked well for their peers that they could also utilize. Once they had an idea about what they wanted to do, they could then look for help further help—i.e. technical support—to implement a specific technology in their own teaching.

Some previous research in this area suggests that teachers should participate in long-term professional development activities that focus on technology use in pedagogically sound ways (Brinkerhoff, 2006; Lowther et al., 2008). Teachers in this study did not appear to have opportunities to participate in such structured professional development activities. Rather, they tended to select and attend generic-type workshops (e.g. Blackboard tools) provided at the university level or more custom-tailored workshops (e.g. Moodle workshops in the English department) provided at the department or program level. Although many teachers still seemed to learn from both types of workshops, there were a few comments made about them not being so useful because the teachers did not end up using the specific tools discussed in the workshop. This finding supported Y. L. Chen's (2008a) conclusions that workshops focusing purely on technology tools may not be as efficient if the teachers do not see a pedagogical value. Therefore, the findings of this study imply that organizing professional development activities to encourage technology use is a double-edged sword. On one hand, teachers who attend such professional development activities become aware of and learn some technologies that they could use in their teaching. On the other hand, general workshops focusing on just tools, rather than on the pedagogical approaches, do not seem to benefit all language teachers. Therefore, the findings of this study suggest that language teachers can be encouraged to attend workshops to raise their awareness about available tools and resources that can be used in teaching. However, to fully integrate any specific technology, those teachers might need to be further supported by technical support personnel. This kind of collaboration might ensure that

teachers gain the required technical skills associated with using the technology, while also having the opportunity to discuss pedagogical considerations as well.

In sum, ecosystem-level factors that impacted university-level language teachers included *access to technology*, *funding opportunities*, *administrative support* and *professional development*. The discussion now turns to how teacher-ecosystem interaction impacts university-level language teachers' technology use and integration.

Teacher-Ecosystem Interaction

As the keystone species, teachers are in constant interaction with the other members of the ecosystem, which in turn impacts their classroom practices (Zhao & Frank, 2003). The results of this study indicated that *student characteristics*, *peer interaction*, *inter-departmental collaboration*, and *technical support* were the factors that emerged by teachers interacting within the ecosystem to which they belong (See Figure 9). Each of these teacher-ecosystem interaction factors are discussed next.

Student Characteristics

Results from this study indicated that teachers' interaction with *students* played a key role in language teachers' technology use. However, the findings appear to be different from what have been found in previous studies related to student characteristics. Previous research reported some student characteristics, such as lack of technical skills and abilities, created a barrier for teachers to use and integrate technology in instruction (Lam, 2000; Osika, Johnson, & Bueta, 2009; Shin & Son, 2007). Teachers in this study, on the other hand, referred to student characteristics as contributing factors to technology use in teaching. In particular, teachers who

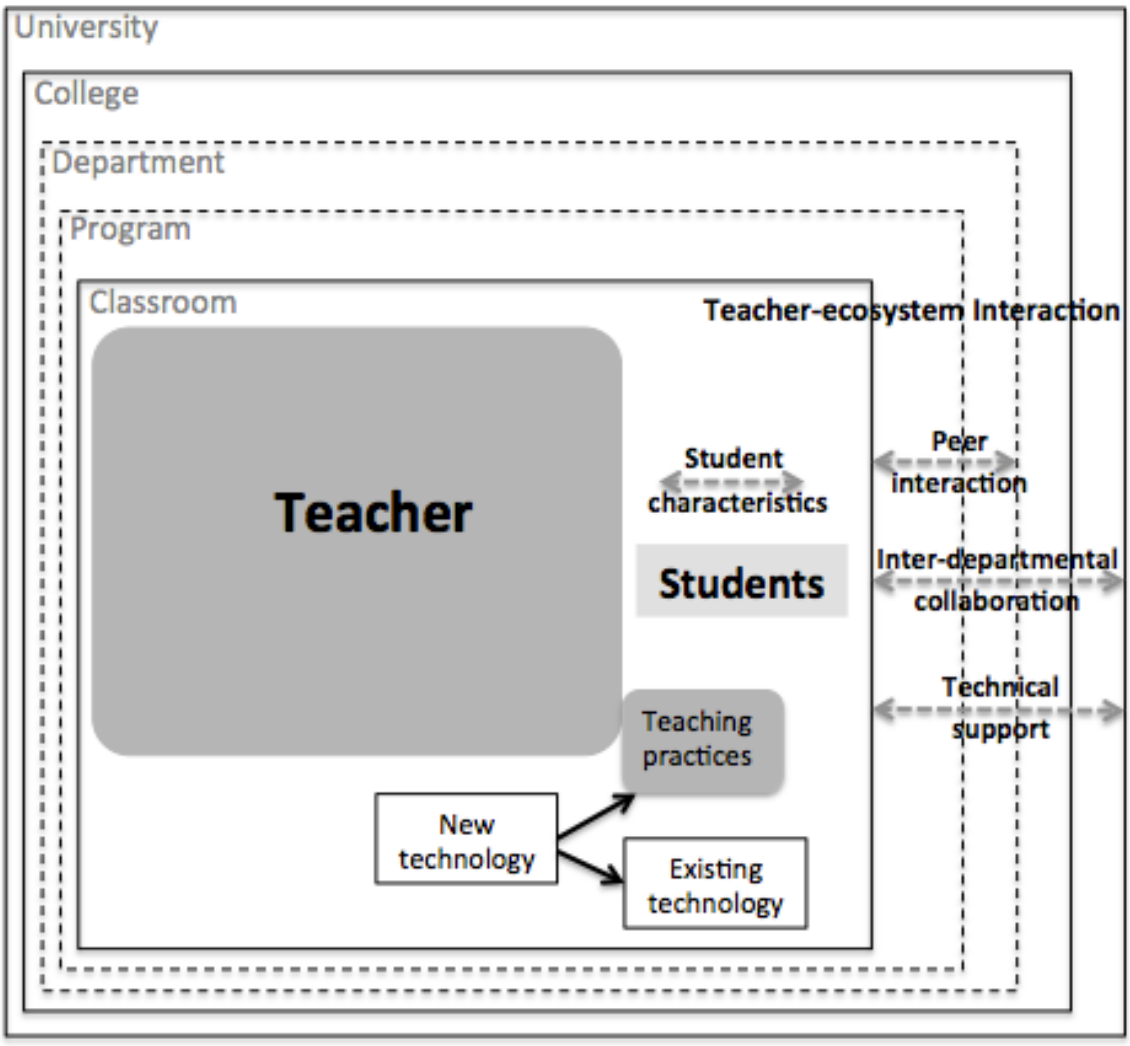

Figure 9. Teacher-ecosystem interaction factors in a language teaching ecosystem in higher education context

participated in this study felt pressure from their students to use more technology in their teaching. Teachers commented that they could connect better with their students when they used technology because that is what students do all the time in their daily lives. More interestingly, even the limited technology-using teachers adopted and used certain technologies just because they received many requests from their students to do so. Hence the 'net generation' students seemed to expect that technology be an important part of their education (Oblinger & Oblinger, 2005).

It is also important to note that students' lack of access to technology outside of the classroom has, in the past, discouraged teachers from integrating technology into their lessons (Winke & Goertler, 2008; Zhao, 2003). Teachers in this study, on the other hand, stated that they had not received any complaints from students regarding not having technologies needed in courses. Students had their own computers or other type of technology to do the tasks assigned in their language classroom, which might imply that technology has become more accessible for college students (Smith, Salaway, Caruso, 2009).

The findings also suggested teachers' interaction with students occasionally resulted in avoiding certain technologies. For example, Kate quit using *Second Life* because students complained that they were spending more time trying to learn the technology than trying to learn the language. The fact that they used a variety of tools in their daily lives did not necessarily mean they wanted to experience all learning through technology. It appears that students want to see more of a "balanced use" of technology in their academic environments (Smith, Salaway & Caruso, 2009). If they do not see an agreement between what they needed and what they could get out of using technology, they may resist technology (Karabulut, LeVelle, Li, Suvorov, 2012).

Overall, teachers' interaction with students seemed to play a role in what was done or not done in the classroom. In some cases students contributed to overall technology use and integration by pressuring their teachers to integrate more technology in their teaching. In other cases, students discouraged the adoption of emerging technologies (like Second Life) because they do not want to waste class time

on learning a new technology instead of learning the language. Following is a description of how peer interaction impacted university-level language teachers' technology use and integration.

Peer Interaction

Peer interaction was found to affect university-level language teachers in two ways; it helped raise their awareness of technology, and enabled them to receive immediate help in troubleshooting. First, when teachers conversed about what they do in their classrooms, they exchanged opinions about what works and what does not work, and they gave each other ideas about how they could use technology to teach certain learning objectives. Some of the teachers in this study, particularly the ones who shared offices, indicated that they learned some of the technologies that they used in their teaching from their peers. Other research has reported that colleagues are often the main source of information for L2 teachers (Chen, 2008b; Egbert et al., 2002). A strong collegial environment, where teachers interact with each other and exchange information and ideas, seemed to be an essential component in technology integration (Glazer et al., 2005; Sahin & Thompson, 2007; Zhao & Frank, 2003).

Furthermore, peers are probably the easiest individuals to consult with when teachers have technical issues. This is especially true when they know their peers are using the same technologies and doing the same activities as they are, so ultimately they may encounter the same problems. The results of this study indicated these teachers looked to their peers for help with a problem before asking a technical support person who might not be directly involved in the classroom projects. As noted in

previous research, just-in-time and contextualized help from colleagues might eliminate technical glitches that might disrupt the learning during a class period (Zhao & Frank, 2003). The next teacher-ecosystem interaction factor, technical support, is now discussed.

Technical and Pedagogical Support

The results from this study indicated that language teachers' interaction with technical support personnel, when they actively seek help to address technical issues, appeared to contribute to their technology use and integration. The results of this study indicated that all three research units had access to technical support at the university, department, and program level. The presence of technical support ensures that teachers can keep up with the fast and constantly changing nature of computer technology, and that technical issues are addressed in a timely manner (Glazer & Page, 2006; Kessler & Plakans, 2008; Whitfield & Latimer, 2003).

In particular, having access to different technical and pedagogical support systems seemed to contribute to successful technology use for teachers, for two main reasons. First, using tools that are supported at the university-level encouraged teachers to adopt certain technologies because they could easily get help - even on the phone. Such central support comforts teachers and assures that any technical issue will be addressed within a reasonably short period of time.

Second, working one-on-one with a technical and pedagogical support person who has expertise in both language teaching and technology helped teachers develop technology projects that would target specific learning goals. Teachers' interaction with

the technical support person ensures that technology is used pedagogically sound ways to teach the content as recommended by Mishra and Koehler (2006). For example, teachers in the World Languages and Cultures program repeatedly cited the Language Studies Resources Center director as both a source of information in regards to technologies that can be used in language teaching, and as a 'go-to' person when they had technical issues. When the researcher asked the exemplary technology-using teachers what recommendations they would make for language teachers who are potential technology users one of the most prominent answer was "to go to the LSRC director." Overall, the results of this study indicated that technical support is not only vital to keep the equipment functioning properly, but also crucial for providing pedagogical support tailored for language teaching. In addition to interacting with the technical and pedagogical support person, exemplary technology-using teachers in this study indicated that they also collaborated with teachers and researchers from other departments. How this inter-departmental collaboration, another teacher-ecosystem interaction factor, contributed to their technology use and integration is discussed next.

Inter-departmental Collaboration

Some teachers and administrators in this study (e.g. Susan, Kate, Bethany) highlighted how they received support by interacting with individuals from other units on campus who had special interests in technology and language learning. This type of inter-departmental collaboration might help bridge research and practice. Specifically, people who are interested in researching the potentials of technology for language learning and teaching may not be assigned to teach in these classrooms. Individuals with

teaching assignments, on the other hand, may not be aware of the affordances of technology in language teaching, or they may not possess the technical skills required to design and implement technology-assisted activities. As the results of this study indicated, such inter-departmental collaborative efforts might benefit both parties and contribute to university-level language teachers' successful use and integration of technology. Although prior research acknowledged the positive impact of peer support and peer interaction, there is no mention of inter-departmental collaboration. Such collaboration among similar departments or programs might be encouraged more, which in turn would affect the overall technology use throughout the campus.

Summary

In sum, the results of this study provided valuable insights into the research on factors impacting university-level language teachers' technology use and integration. The findings of the individual research goals will be summarized next.

The first research question identified specific teacher-level factors impacting university-level language teachers' technology use and integration. The results indicated that these teacher-level factors included teachers' *beliefs about the role of technology, daily technology use, technical skills, training in technology*, and *professional/research interests*. The most prominent finding here was how beliefs about the role of technology were central to the overall technology use and integrating in language teaching. Although technical skills, daily computer use or training in technology seemed to contribute to overall technology use, the lack of these factors did not really create a

barrier if teachers believed that technology played a positive role in language teaching and learning.

The second research question aimed to identify the ecosystem-level factors that have impacted university-level language teachers' technology use. The findings indicated that at the ecosystem-level, *access to technology*, *financial support*, *administrative support*, *professional development opportunities*, and *student characteristics* all had reasonable impacts on overall technology use. Having access to a variety of technological tools and resources eased teachers' minds about logistics so that they could focus on pedagogical aims and how technology could target their learning objectives. Similarly, receiving additional grant funding enabled teachers to pursue even more complex technology-enhanced projects to finance the human capacity needed for developing the projects. Professional development activities such as workshops and informal meetings seemed to raise teachers' awareness about possibilities and affordances that specific technologies could offer. Finally, as the 'net-generation', students seemed to pressure language teachers to use technology in their teaching. Results indicated that even the limited technology-using teachers adopted certain technologies just because students wanted to do them. However, this did not mean that students were ready to accept any technology used for language instruction. When they felt like they spent more time on learning the technology than on actually learning the language, concerns were raised.

The third research question identified the factors that emerged through teachers' interaction with the ecosystem. The results indicated that *peer interaction,*

inter-departmental collaboration, and *technical support* contributed to successful technology use in a university-level language teaching environment. To sum, when language teachers interacted with their peers, colleagues from other departments and more importantly, with a technical support person, they increased their awareness about different technologies that could be used to teach languages and create activities that they could not otherwise do on their own.

With this general summary of the findings for the current study, it is necessary to look in more detail at some of the limitations that affected the results of this study. Likewise, it is important to look at the practical and theoretical implications that this study has for language teaching and language teacher preparation. Moreover, we need to decide what these results may mean for the area of language teaching and technology. These issues are discussed next.

Limitations of this Study

Like most studies, this study encountered a few limitations that should be taken into consideration when interpreting the results. The first limitation concerns the low number of limited technology-using teachers participating in this study. Participant recruitment in this aspect was a challenge mainly for two reasons. First, the administrators had difficulty in nominating language teachers who used technology to a lesser extent because they opined their teachers used technology in one way or another. Second, although four teachers that were nominated as limited technology-using teachers were invited to participate in this study, two did not respond to the invitation e-mail. Listening to perspectives of more teachers who are not high-level

users of technology might better reveal the factors that hinder technology adoption in language teaching at the university-level. Furthermore, only one teacher from the IEP participated in this study. Although this study has no intention of generalizing the findings from one teacher to the whole program, more teachers from the Intensive English Program would have provided perspective to the issues under investigation.

Second, no data were collected directly from students, so the conclusions drawn about student characteristics are the perspectives of administrators and teachers. Inviting students to participate in the study might have resulted in a better description of how they viewed using technology to improve their language acquisition and how they pressured their teachers to use, or not use any particular technology.

A final limitation of this study was lack of observation data for some of the participants. In particular, two limited technology-using teachers were not observed due to scheduling issues and different teaching assignments. Observing those teachers would help triangulate the data collection methods and draw more concrete conclusions about what contributed to or hindered their technology use or non-use.

Practical Implications for Language Teachers

The findings of this study have practical implications for language teachers to successfully use and integrate technology in their instruction. As the keystone species of the school ecosystem, teachers need to be proactive about utilizing the existing resources and seeking additional opportunities that might contribute to their overall technology use and enhance their teaching. The following recommendations can be made for language teachers who want to pursue pedagogies that involve technology.

Integrate technology to your research focus: The results from this study indicated that if the teachers' research and publishing interests were related to or included technology, they were more likely to use technology in their teaching. If language teachers integrate technology into their teaching; design and conduct a research study about it; and publish the results, it will contribute to their retention, tenure, and promotion while enhancing their instruction. In addition, when language teachers attend conferences and read related journals, they will be more aware of innovative teaching practices that include technology.

Utilize existing funding opportunities: The results from this study implied that university-level language teachers might have additional funding opportunities provided at the college or university level. Being proactive about seeking out such opportunities may ensure language teachers that they have access to hardware and software that are specific to language teaching and learning. Additionally, they can use such funding to hire people who can help them design technology-enhanced activities and tasks.

Utilize professional development opportunities: Another finding from this study was that language teachers selectively attended professional development activities in provided at the university, college, department or program level. These professional development activities improved their technical skills as well as raised their awareness about how they can use technology to meet their learning objectives. Therefore, this implies that language teachers need to make use of professional development activities provided in different units around the campus as well as off-campus.

Listen to the students: The findings from this study particularly indicated that college students expected to see technology used in their language classrooms. Receiving feedback from students about what technologies they use in their daily lives that can be transferred to language learning can be a way of bridging students' daily life to their school life while enhancing opportunities for language teaching and learning.

Interact with peers and other colleagues: Interacting with other language teachers who use technology in their teaching might raise language teachers' awareness about the possibilities and affordances that technology provides in language teaching. In addition, language teachers might address technical issues more easily when they interact with their peers as they might have encountered the same issues. Additionally, collaborating with colleagues across colleges might bring together people who have similar interests but different skills. Language teachers might look for opportunities to meet with other teachers and researchers who might be interested in doing research on technology and language learning. This might raise language teachers' awareness about how they can use different technological tools to enhance their instruction.

Consult with the technical and pedagogical support personnel: In parallel to the investment in technological infrastructure, universities seem to place support personnel who can help language teachers to integrate technology into instruction. The results from this study implied that exemplary technology-teachers collaborated and consulted with technical and pedagogical support personnel both at the university and department or program level. These teachers clearly indicated that they learned about the technologies they used to improve their language teaching practices from those

people who provide technical and pedagogical support. Therefore, it can be recommended that language teachers be proactive about seeking help from individuals who are there to help them.

Practical Implications for Language Programs

The findings of this study have practical implications for language programs that are interested in integrating technology into instruction. Mainly, the study recommends language programs to create an ecosystem that is conducive to technology use. This can be achieved in the following ways—although not in any particular order:

Provide institutional leadership and support: This refers to promoting technology use at different hierarchical levels of the university ecosystem. Institutional leadership points to the philosophical stance on the positive role of technology in language instruction. For example, the LSRC in World Languages and Cultures explicitly included references to "supporting the meaningful integration of technology into world language and teaching" ("About the Language Studies Resource Center ", 2012). Such statements might lead teachers to infer that they are expected to use technology in their teaching. Another more concrete impact of institutional leadership lies in the further financial support for teachers to develop technology-enhanced activities and projects.

Provide administrative leadership: Another aspect of an environment that is conducive to technology use is providing support at the administrative level. If the administrators provide leadership and encourage technology use, teachers are more likely to use technology in their instruction. However, this does not mean that administrators should dictate what teachers should do in their classrooms. Rather, the

administrators should create opportunities that would promote technology use and integration, like providing release time or other incentives, and raising awareness about different possibilities that teachers might utilize.

Provide technical and pedagogical support: Having a technical support person in their immediate environment might help language teachers address issues in a timely manner, and can limit frustration caused by improperly functioning tools. However, this is not sufficient for the overall use and integration of technology into language instruction. Having someone with a background in both language teaching pedagogy and technology with whom teachers could work with on a one-to-one basis was found to be immensely influential in the successful technology use of teachers who participated in this study. Other language programs might consider investing in hiring such an expert to support their teachers to design and develop technology-enhanced activities and projects.

Provide access to technology and resources: This refers to both providing the infrastructure and equipment that language teachers might need, as well as providing administrative support. The results of this study indicated that having a center like Language Studies Resources Center in the World Languages and Cultures department contributed immensely to successful technology use because teachers had access to technology and resources that were available to both teachers and students.

Provide professional development opportunities: Technology changes so fast that it forces teachers to be life-long learners and continually learn innovative ways to use technology that will enhance their teaching. Although self-edification seems to be the

most common strategy for learning about different kinds of technologies, language programs can organize in-house professional development activities that are tailored for specific audiences (e.g. workshops, brown bag meetings) as well as encouraging teachers to attend other professional activities (e.g. university-wide workshops and conferences).

Facilitate peer interaction and inter-departmental collaboration: Giving teachers an opportunity to share ideas and to help one another might increase overall technology use in a given language program. Similarly, collaborating with people from different departments who may be interested in language teaching and technology might raise language teachers' awareness about various technological tools and resources that can be used in language instruction.

Encourage research on technology use and integration: Encouraging language teachers to connect their research activities to their teaching practices might increase overall technology use. Language teachers can engage in scholarly activities (e.g. publishing articles, presenting at conferences) based on their use of technology for language instruction. This may contribute to their retention, tenure, and promotion process while providing technology-enhanced experiences for their students.

Implications for Language Teacher Preparation Programs

The findings of this study might provide helpful insights for language teacher preparation programs about how to prepare their students to teach with technology. As stated earlier, the single most important determiner of technology use or non-use is the 'teacher'. Therefore, language teacher preparation programs need to focus on

developing positive attitudes in pre-service teachers towards technology use in language instruction. This can done through modeling specific examples of how technology improves student learning; providing opportunities to work closely with a technology-using classroom teacher; and teaching not only technical skills but also pedagogical reasoning behind technology use so that teachers can make the connection and use technology to reach a learning goal rather than using it for the sake of technology (Mishra & Koehler, 2006). Finally language programs can build on pre-service teachers' daily technology use and model how that can be transferred to instructional use.

Theoretical Implications for the Ecological Perspective

This study addressed the lack of theoretical background in many studies that analyzed the contributing factors or barriers to technology use and integration in educational environments (Albirini, 2006; Egbert, Paulus, Nakamichi, 2002; Kahveci, 2011) by adopting an ecological perspective (Zhao & Frank, 2003; Davis, 2008; 2011; in press) as a theoretical framework. The ecological perspective provided a baseline for examining the multi-faceted factors that were in constant interaction with each other and how they influenced teachers' classroom practices with technology. In other words, the framework allowed the researcher to not only identify individual factors that might impact university-level language teachers' technology use, but also to focus on the interactions among these factors.

The results of this illustrated that the ecological perspective can be used as a theoretical framework to conceptualize the factors impacting university-level language

teachers' technology use or non-use in their instruction. In particular, study findings approved the assumptions of the concept of *keystone species* and *ecological hierarchy*. In this regard, findings indicated that teacher-level factors were strong indicators of technology use, as teachers are the *keystone species* of the educational ecosystem. Similarly, the closer the other factors are to the teacher the stronger the impact appeared to be. For example, teachers in this study liked to receive support from their departmental tech support even though they had access to university-wide support.

Directions for Future Research

Based on the findings of this study, it is possible to suggest some directions for future research. First of all, this study can be replicated at other institutions and a cross-case analysis can be employed to compare and contrast different educational ecosystems at the school level. Another research possibility could be to design a survey based on the findings from this study and conduct it in a larger scale to test the higher education ecological diagram drawn earlier in this dissertation and generalize the conclusions of a larger population. Next, the impact of individual factors identified in this study can be investigated further. For example, the Intensive English Program was planning to hire someone with a background in technology and language teaching to assist teachers with technology use and integration. To what extent and/or how the IEP teachers' overall technology use changes or improves when they have someone in their immediate environment, would be useful to investigate. For another example, a longitudinal case study of a language teacher can be conducted to see how his/her beliefs about the role of technology co-evolves when s/he interacts with other species

(e.g. students, peers, technical support personnel). The ecological perspective can also be used to study under what conditions language teachers use technology for higher-level cognitive tasks that go beyond having a course management site to take attendance and put the materials online. Finally, factors impacting K-12 language teachers' technology use and integration can be investigated as well.

Concluding Remarks

The purpose of this study was to reveal the factors impacting university-level language teachers' technology use and integration. This central question was chosen as a starting point because of the concerns raised in previous CALL research that technology has not yet been *normalized* in language instruction (Bax, 2003) despite the many affordances of technology that have been documented (Chappelle, 2003; Pennington, 1998; Zhao, 2003). Analyzing the contributing factors or barriers to language teachers' technology use, this research might shed light on this issue and inform language programs and language teacher preparation programs while contributing to research in CALL and educational technology.

Furthermore, two seminal studies that reviewed the research on technology and language learning concluded that CALL research focused more on the implementation of a single application, instead of large-scale integration of technology, and disregarded teacher voices, experiences and contexts (Egbert et al., 2009; Zhao, 2003). Analyzing the factors impacting overall technology use in language instruction from the perspectives of teachers, and understanding their realities and beliefs would therefore contribute to research on technology and language instruction.

That said, this study employed a single-case study methodology with three embedded units of analysis to understand the beliefs, practices, and perspectives of university-level language teachers' technology use or non-use. The study described the ecological perspective and how it could provide a framework to understand the complex interaction among the many factors that contribute to or hinder technology use in language instruction. The findings of this study established that teacher-level and ecosystem-level factors, as well as the factors drawn out of the teacher-ecosystem interaction, had impacts on overall technology use in language instruction. In particular, the study established that teacher-level factors—their beliefs about the role of technology in language instruction—played a key role in the extent and nature of technologies that language teachers used in their instruction.

The results of the study provided valuable and detailed information about what kind of variables might be impacting language teachers' decisions on and practices about integrating technology into their instruction. Thus, the data that was collected can inform stakeholders in language programs and language teacher preparation programs. Language programs can learn how to budget resources—i.e. equipment, additional financial support for teachers; what kind of support systems should be budgeted; and how they can provide leadership so that teachers at their institutions can use technology to improve language instruction. Finally, language preparation programs can learn what to address when they are preparing their pre-service language teachers to teach in tomorrow's classrooms.

To conclude, it needs to be acknowledged that the results of this study are not cut-and-dry facts that the factors identified here are the only ones that stakeholders need to recognize. Considering that technology—computer technology in particular—is being pushed into institutions of higher education, this study provides a starting point for stakeholders about what to pay attention to for facilitating technology use and integration into language instruction. The stakeholders might need to analyze their own ecosystems and provide opportunities for teachers to have interaction with the other species in the ecosystem that might contribute to successfully integrating technology into their instruction. Conducting this research has been an enriching and inspiring experience for the researcher. It has already provoked ideas for future research and practical implications for a possible future career as an expert in the field of technology and language instruction.

APPENDIX A: OVERVIEW OF THE METHODOLOGY OF THE STUDIES INCLUDED IN THE REVIEW

Author	Participants	Design	Data source	Content Area Taught	Country
Akbaba-Altun (2006)	17 principles, 15 computer coordinators, 151 primary supervisors	Qualitative	Interviews	ALL	Turkey
Albirini (2006)	320 high school teachers	Quantitative	Survey	EFL	Syria
Al-Senaidi et al. (2009)	100 faculty members	Quantitative	Survey	ALL	Oman
Anderson & Dexter (2000)	488 school principals	Quantitative	Survey	ALL	USA
Baek et al. (2006)	202 teachers	Quantitative	Survey	ALL	Korea
Baylor & Ritchie (2002)	94 teachers from 12 schools	Quantitative	Interviews	ALL	USA
Becker (2000)	4000 teachers	Quantitative	Survey	ALL	USA
Brinkerhoff (2006)	25 teachers (6 included in interviews)	Mixed-method	Survey	ALL	USA
Chambers & Bax (2006)	14 teachers, 1 college principal	Qualitative	Informal conversations, interviews, participant observation, classroom observations	ESL	USA
Chen (2008)	22 teachers	Qualitative	Interviews	EFL	Taiwan
Chen (2008)	311 teachers	Mixed-method	Survey and interview	EFL	Taiwan
Chen & Reimer (2009)	12 teachers (3 cases were included in the study)	Qualitative	Classroom observations, interviews and documents	ALL	Taiwan
Drent & Meelissen (2008)	210 teacher educators	Mixed-method	Survey and interviews	Teacher education	Netherlands
Ebswrorth et al. (2010)	43 pre-service teachers, 47 in-service teachers	Mixed-method	Survey and interview	ESL, EFL, Bilingual Education	USA
Egbert et al. (2002)	20 ESL and FL teachers	Mixed-method	Survey and structured Interviews	ESL/EFL	USA

Ertmer et al. (2007)	25 teachers	Mixed-method	Survey	ALL	USA
England & Kong (2007)	68 EFL teachers at university level	Mixed-method	Survey and follow up interviews	EFL	Egypt
Granger et al. (2002)	4 schools chosen from 12 (teachers, administrators, librarians, students)	Qualitative	Interviews	ALL	Canada
et al. (2008)	525 teachers from 68 schools	Quantitative	Survey	Primary school	Flanders
Hutchison & Reinking (2010)	1441 literacy teachers	Quantitative	Survey	K-12 Literacy	USA
Inan & Lowther (2010a)	1382 teachers from 54 schools	Quantitative	Survey	ALL	USA
Inan & Lowther (2010b)	379 teachers from 76 schools	Quantitative	Survey	ALL	USA
Kahveci et al. (2011)	130 secondary teachers from 3 schools	Quantitative	Surveys	ALL	Turkey
Kennedy & Stockwell (2009)	3 teachers	Qualitative	Descriptions of experiences	Italian	Australia
Kessler & Plakans (2008)	7 teachers	Qualitative	Interviews; classroom recordings	ESL	USA
Kessler (2007)	108 TESOL masters graduates	Quantitative	Survey	ESL	USA
Kessler (2006)	240 graduates of TESOL MA programs	Mixed-method	Survey, focus groups and interviews	ESL	USA but teachers are all over
Lam (2000)	10 graduate students	Qualitative	Survey and interviews	L2 (ESL, Spanish, French)	USA
Liu (2011)	1340 teachers	Quantitative	Survey	Elementary	Taiwan

Lu (2006)	67 teachers	Quantitative	Survey	ESL	USA
Lowther et al. (2008)	54 schools	Mixed-method	Classroom observation, surveys, student performance assessments	ALL	USA
Meskill et al. 2002	2 expert teachers and 5 novice teachers	Qualitative	Interviews, reflective journal entries	Language and Literacy	USA
Meyer et al. (2011)	16 teachers	Mixed-method	Surveys, analysis of student portfolios, semi-structured Interviews	ALL	Canada
Mueller, et al. (2008)	185 elementary 204 secondary teachers	Quantitative	Surveys	ALL	Canada
Osika et al. (2009)	75 teachers	Quantitative	Survey	College level ALL	USA
Owston (2007)	59 cases from 174 schools in 28 countries	Qualitative	Classroom observations, interviews and local documents	ALL	International
Papanastasiou & Angeli (2008)	578 teachers	Quantitative	Survey	Elementary teachers	Cyrprus
Sahin & Thompson (2007)	43 teacher education faculty	Quantitative	Survey	College of education	USA
Shin & Son (2007)	101 Korean teachers	Mixed-method	Survey	EFL	Korea
Tondeur et al., (2008)	574 elementary teachers from 57 schools	Quantitative	Survey	Primary schools	Flanders
van Braak (2000)	233 teachers	Quantitative	Survey	Secondary	Brussels
Winke & Goertler (2008)	911 students	Quantitative	Survey	Language (CALL)	USA
Wozney et al. (2006)	764 teachers	Quantitative	Survey	ALL	Canada

Wu et al. (2006)	1,002 junior high science teachers	Quantitative	Survey	Science	Taiwan
Yunus (2007)	444 ESL teachers	Mixed-method	Survey and interviews	ESL	Malaysia
Zamani (2010)	40 teachers, 250 students	Mixed-method	Survey, interviews, and observations	ALL	Iran
Zhao & Frank (2003)	19 schools (staff, teachers	Mixed-method	Survey, interviews, observations	ALL	USA

APPENDIX B: INTERVIEW PROTOCOLS

Questions for Administrators:

1. Can you introduce yourself? (background, education, how long have you been doing this job)
2. How do you describe your role as a director/coordinator/department chair?
3. What kind of facilities do you have available for teachers and students (Ask for more details for each of the points that they raise)?
4. How does your organization facilitate communication among the teachers?
5. What kind of professional development opportunities does your organization provide for the teachers?
6. What do you do as the director/coordinator/department chair to encourage teachers to create an effective learning environment?
7. What do you think the role of technology is in teaching languages?
8. Do you think the teachers in your organization use technology (available facilities) to enhance their teaching?

Follow up: Why do you think some do and some don't

9. Can you nominate two teachers you identify as exemplary technology-using teachers?
10. Can you nominate two teachers who resist/do not use technology?
11. Why do you nominate those teachers?

Questions for Technical and pedagogical support personnel:

IEP Language Lab Coordinator

1. Can you introduce yourself (age, background, major, tech use in daily life)?
2. What is your role in IEP as the language lab coordinator?
3. What kind of resources do you have available for student and teacher use?
4. What kind of help do you provide to the teachers?
5. What kind of questions do the teachers usually have (technical/resource location)?
6. Do you get questions from the same teachers all the time? (Do you have regular visitors?)

ISUComm Instructional Technology Coordinator:

1. Can you introduce yourself (age, background, major, tech use in daily life)?
2. What is your role in the English department as the instructional technology coordinator?
3. What kind of resources do you have available for student and teacher use?
4. How different do you think the needs of ESL and IEP teachers from other teachers in the department?
5. What kind of help do you provide to the teachers? (e.g. answering individual questions, workshops)
6. What kind of questions do the teachers usually have (technical/resource location/pedagogical)?

7. Do you get questions from the same teachers all the time? (Do you have regular visitors?)

Questions for Teachers

Technology User

1. Can you introduce yourself (age, background, education) (Ask about whether they had taken any CALL or technology class)
2. How long have you been teaching?
3. What skill/language are you teaching?
4. How many hours are you teaching? How many hours do you spend preparing for your classes?
5. How many students do you have in your classes?
6. What other responsibilities do you have as a faculty member in ….
7. What do you think the best methods are to teach a language?
8. How do you decide what your students need to learn/know? (strict curriculum, textbook, syllabus)
9. What kind of technologies do you use in your daily life and for what purposes?
10. How would you rate yourself as a technology user?
11. What is your perception of technology in general?
12. What do you think the role of technology is in language teaching and learning?
13. You were nominated as the exemplary technology use by your department chair/director/coordinator. How would you describe your technology use in your

teaching (before/during/after)? What kind of technologies do you use in your teaching?

14. Do you have access to technologies you need for your class in your organization? Do you have to reserve ahead of time?
15. Where do you learn about technologies that you can use in your teaching?
16. What do you think is the best resource for learning about different technologies that can be used in language teaching? Can you easily identify the resources you can use? Do you have enough resources for the language/skill that you are teaching?
17. Why do you prefer to use technology in your teaching? (What is the rationale behind your technology use)
18. What kinds of support systems are available in your organization that helps you integrate technology into your teaching?
19. Do you get appreciation/incentives for your exemplary technology use in your teaching by department/colleagues/college/university? (If yes, does that motivate you in technology use?)
20. How do students react to the activities that require them to use technology? (Do they resist/get on board quickly)
21. What do you do when technology fails?
22. What do you think/know about student access to technologies that are required for language learning?
23. Can you describe a typical class of yours?

24. If you could make a recommendation to other teachers who wanted to do more with technology in their classrooms, what recommendation would you make?

Technology Non-User

1. Can you introduce yourself (age, background, education) (Ask about whether they had taken any CALL or technology class)
2. How long have you been teaching?
3. What skill/language are you teaching?
4. How many hours are you teaching? How many hours do you spend preparing for your classes?
5. How many students do you have in your classes?
6. What other responsibilities do you have as a faculty member in ….
7. What do you think the best methods are to teach a language?
8. How do you decide what your students need to learn/know? (strict curriculum, textbook, syllabus)
9. What kind of technologies do you use in your daily life and for what purposes?
10. How would you rate yourself as a technology user?
11. What is your perception of technology in general?
12. What do you think the role of technology is in language teaching and learning?
13. What is the role of technology in YOUR teaching?
14. Do you think you can easily locate [technological] resources if you want to use technology?
15. Do you talk to your colleagues about what you do in your classes?

APPENDIX C: CLASSROOM OBSERVATION TOOL

Classroom Observation Tool

1. Setting

Date: _____

Program: _____

Teacher: _____

Class: _____

Students: _____

Observation Start Time: _____

Observation End Time: _____

2. Room description and student characteristics

_____

_____

_____

3. Student groupings (check all observed during the period):

____ Individual student work ____ Small groups

____ Student pairs ____ Whole class

____ Other (comments):

_____

_____

4. Teacher Roles (check all observed during the period)

____ Lecturing ____ Facilitating/Coaching

____ Interactive direction ____ Modeling

____ Discussion ____ Other (comments):

_____

_____

Adapted from ISTE Classroom Observation Tool, 2008

Classroom Observation Tool

5. Learning activities

_____

_____

_____

6. How essential was technology to the teaching and learning activities?

____ Not needed; other approaches would be better

____ Somewhat useful; other approaches would be as effective

____ Useful; other approaches would not be as effective

____ Essential; the lesson could not be done without it.

Comment:

_____

_____

_____

7. Technologies used by teacher

_____

_____

_____

8. Technologies used by students

_____

_____

_____

Adapted from ISTE Classroom Observation Tool, 2008

Classroom Observation Tool

9. Three-Minute Chart

Technology is:	:00-:03	:03-:06	:06-:09	:12-:15	:15-:18	:18-:21	:21-:24	:24-:27	:27-:30	:30-:33	:33-:36	:36-:39	:39-:42	:42-:45	:45-:48	:48-:51
In use by students																
Used for learning																
In use by teacher																
Used for learning																

Technology is:	:51-:54	:54-:57	:60-:63	:63-:65	:65-:68	:68-:71	:71-:74	:74-:77	:77-:80	:80-:83	:83-:86	:86-:90
In use by students												
Used for learning												
In use by teacher												
Used for learning												

Adapted from ISTE Classroom Observation Tool, 2008

APPENDIX D: INFORMED CONSENT DOCUMENTS

INFORMED CONSENT DOCUMENT

Title of Study: Factors impacting university-level language teachers' technology use and integration
Investigators: Aliye Karabulut, Denise Schmidt-Crawford

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to identify the enablers and barriers impacting language teachers' technology integration into their classrooms. You are being invited to participate in this study because you have an administrative position at a language department at Iowa State University.

DESCRIPTION OF PROCEDURES

If you agree to participate, you will be asked to participate in one or two interviews that will take approximately 45-60 minutes. The second interview will be done if there is any need for follow up. The questions will be about your perception of the role of technology in language teaching, facilities and support you provide to the teachers at your institution, what kind of factors facilitate or hinder technology use in your department. You will be asked to give permission to tape record the interviews. The principal investigator will also do field observations for a day in technology labs and resource centers that you are responsible for. She will be looking at who is using the labs and the resource centers and what kind of help they request from the support staff.

RISKS

There are no foreseeable risks for participating in this study.

BENEFITS

If you decide to participate in this study there may be no direct benefit to you. It is hoped that the information gained in this study will benefit society by advancing knowledge about how to create effective language learning environments. By identifying the barriers that hinder teachers' technology use, necessary precautions can be taken at the instituional level. Also, identifying the factors that impact language teachers' technology use will shed light on ways to enable teachers to overcome the barriers. Decision makers can be informed about how they can address teachers' concerns based on the factors that influence language teachers' decisions about technology integration. Overall, this study will contribute to the improvement of language instruction in an increasingly global world.

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide not to participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. You can skip any questions that you do not wish to answer.

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: No identifying information will be used and your name will be replaced with a pseudo name. The data will be kept in password secure file in the researcher's personal computer and they will be destroyed within two years after the study is complete. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during this study.

- For further information about the study contact Aliye Karabulut (1515-509-4703) or Dr. Denise Schmidt-Crawford (1515- 294-9141)
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

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PARTICIPANT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant's Name (printed) _____

_____ _____

(Participant's Signature) (Date)

INFORMED CONSENT DOCUMENT

Title of Study: Factors impacting university-level language teachers' technology use and integration

Investigators: Aliye Karabulut, Denise Schmidt-Crawford

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to identify the enablers and barriers impacting language teachers' technology integration into their classrooms. You are being invited to participate in this study because you are a teacher at Iowa State University teaching a foreign language or English as a Second Language.

DESCRIPTION OF PROCEDURES

If you agree to participate, you will be asked to participate in one or two interviews that will take approximately 45-60 minutes. The second interview will be done if there is any need for follow up. The questions will be about your perception of the role of technology in language teaching and what kind of factors facilitate or hinder technology use in your classroom. You may also be asked to give the researcher access to your course materials (e.g. course syllabus, sample assignments, sample classroom activities, course management site). You will be asked to give permission to tape record the interviews. The principal investigator will also do two classroom visits to observe your language teaching pedagogy.

RISKS

There are no foreseeable risks for participating in this study.

BENEFITS

If you decide to participate in this study there may be no direct benefit to you. It is hoped that the information gained in this study will benefit society by advancing knowledge about how to create effective language learning environments. By identifying the barriers that hinder teachers' technology use, necessary precautions can be taken at the instituional level. Also, identifying the factors that impact language teachers' technology use will shed light on ways to enable teachers to overcome the barriers. Decision makers can be informed about how they can address teachers' concerns based on the factors that influence language teachers' decisions about technology integration. Overall, this study will contribute to the improvement of language instruction in an increasingly global world.

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide not to participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. You can skip any questions that you do not wish to answer.

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: No identifying information will be used and your name will be replaced with a pseudo name. The data will be kept in password secure file in the researcher's personal computer and they will be destroyed within two years after the study is complete. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during this study.

- For further information about the study contact Aliye Karabulut (1515-509-4703) or Dr. Schmidt-Crawford (1515-294-9141)
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

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PARTICIPANT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant's Name (printed) _____

_____ _____

(Participant's Signature) (Date)

INFORMED CONSENT DOCUMENT

Title of Study: Factors impacting university-level language teachers' technology use and integration

Investigators: Aliye Karabulut, Denise Schmidt-Crawford

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to identify the enablers and barriers impacting language teachers' technology integration into their classrooms. You are being invited to participate in this study because you have a technology support position at a language department at Iowa State University.

DESCRIPTION OF PROCEDURES

If you agree to participate, you will be asked to participate in one or two interviews that will take approximately 20-30 minutes. The second interview will be done if there is any need for follow up. The questions will be about your perception of the role of technology in language teaching, facilities and support you provide to the teachers at your institution, what kind of factors facilitate or hinder technology use in your department. You will be asked to give permission to tape record the interviews.

RISKS

There are no foreseeable risks for participating in this study.

BENEFITS

If you decide to participate in this study there may be no direct benefit to you. It is hoped that the information gained in this study will benefit society by advancing knowledge about how to create effective language learning environments. By identifying the barriers that hinder teachers' technology use, necessary precautions can be taken at the instituional level. Also, identifying the factors that impact language teachers' technology use will shed light on ways to enable teachers to overcome the barriers. Decision makers can be informed about how they can address teachers' concerns based on the factors that influence language teachers' decisions about technology integration. Overall, this study will contribute to the improvement of language instruction in an increasingly global world.

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide not to participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. You can skip any questions that you do not wish to answer.

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University,

and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: No identifying information will be used and your name will be replaced with a pseudo name. The data will be kept in password secure file in the researcher's personal computer and they will be destroyed within two years after the study is complete. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during this study.

- For further information about the study contact Aliye Karabulut (1515-509-4703) or Dr. Schmidt-Crawford (1515-294-9141)
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

****

PARTICIPANT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant's Name (printed) _____

_____ _____

(Participant's Signature) (Date)

APPENDIX E: DATA ANALYSIS INDICES

Index for Administrators

1. **Background**
    a. Education
    b. Experience
    c. Research Interests
    d. Teaching Interests
2. **Role**
    a. Administrative responsibilities
    b. Relationship with teachers
3. **Resources**
4. **Opinions about teachers**
5. **Reasons for using technology**
6. **Reasons for not using technology**
7. **Professional development**
8. **Beliefs about the role of technology**
9. **Support**
    a. Funding opportunities
    b. Peer support
    c. Technical and pedagogical

Index for Teachers

1. **Background**
    a. Current position
    b. Education
    c. Experience
    d. Interests
    e. Native language
2. **Class size**
3. **Courses teaching**
4. **Curriculum decisions**
5. **Highlights about exemplary technology use**
6. **Issues and solutions**
7. **Opinions about other teachers**
8. **Other responsibilities**
    a. Administrative
    b. Research
    c. Service
9. **Pedagogical beliefs**
    a. Beliefs about language teaching
    b. Beliefs about technology
10. **Professional development**
11. **Reasons for not using technology**

12. Reasons for using technology
- a. Automated help
- b. Easy management
- c. Go green
- d. Input
- e. Personal motivation
- f. Recording is easy
- g. Saves class time
- h. Tech generation
- i. Other

13. Students
- a. Access to technology and technical issues
- b. Do not appreciate
- c. Proficiency level
- d. Technologies required
- e. To be on the same page
- f. Other

14. Suggestions for other teachers

15. Support
- a. Financial
- b. Peer
- c. Technical and pedagogical

16. Technical problems
- a. CMS problems
- b. Issues with publisher content

17. Technical skill level

18. Technology access

19. Technology leadership

20. Technology use
- a. Assessment purposes
- b. For fun
- c. In-class use
- d. Outside the class
- e. Personal use
- f. Research purposes
- g. Language skill area

21. Time
- a. Time spent on preparing for class
- b. Other time related issues

22. Typical classroom
- a. Pair and group work
- b. Prepare technology

23. Where they learn technologies
- a. CALL courses

b. CELT
c. Conferences
d. Online portal
e. Online search
f. Other departments
g. Peers
h. Personal exigency
i. Technology support person
j. Other

24. Work load

Index for Technical Support Personnel

1. Awareness
2. Background
   a. Education
   b. Experience
   c. Interests
3. Opinions about teachers
4. Professional development
5. Resources
   a. Computer labs
   b. Resources used by teachers
   c. Resources used by students
6. Role
   a. Teacher support
   b. Student support
7. Technology use

APPENDIX F: EXAMPLE OF SORTING DATA WITH TRANSANA™

Transana Collection Report

Collection: Teachers > Support

Collection: Teachers > Support
Collection: Teachers > Support
Episode Transcript: Randi
Clip Transcript:
Researcher: When you need some kind of a technology to support your teaching, do you find it easy to locate resources?
Randi: Yes.
Researcher: What do you think the best way is or how do you find out about the technologies that you are using?
Randi: I should say I find technological support easy to find. So change my previous answer. My yes it that [the university] has a lot of different places that I can go that are easy to access.

Collection: Teachers > Support
Episode Transcript: Randi
Clip Transcript:
I considered of doing something with Wimba with the former LSRC director, it never got very far because pre-tenure and I had to do my own stuff.

Collection: Teachers > Support > Financial
Episode Transcript: Kate
Clip Transcript:
Kate: the resources I normally get funds from grants. And that is why I can do all these. Like I put these courses, I was able to work on the course because of a grant, LASCAC and the Miller grant, Miller fellowships. Those, yeah. Yeah, I try to, to apply to those grants, the LASCAC, the Miller, also for a small, the small LASCAC, they give you money the small quantity, but you know, to create activities and things like that for the courses. Yeah.
Researcher: Is that how you like, do you hire TAs helping you develop these materials?
Kate: Yeah, that is what I do. I do, yeah. So, like, right now, the, that we have Blackboard, it was because we got a LASCAC grant and I hired [a graduate student] so he is working on transferring everything from WebCT to Blackboard. And it seems like it is easy to do, but see, you see the courses. That is how it looks and it is really complicated to, you know, put in Blackboard just like that.

Collection: Teachers > Support > Financial
Episode Transcript: Kate
Clip Transcript:

Kate: I was really frustrated when they said we were switching to Blackboard and I "What!" And I said to Travis OK I am gonna help you to pilot this, and when I saw he passed one course that I have to Blackboard, and I saw only one folder. I was getting crazy, and I "no, sorry, I cannot teach, I cannot teach this course with one folder" When you know the course was looking like that. Yeah, so. I do not think if I do not have those resources, I could not, I could not do it. Like again, when you ask me what number to give you, rate, I rate myself like a 3, because I cannot do those. If I do not have a person with, know more about technology or the, the codes and all those things, I do not know how to all that? I do not know much about technology. I like to use it but I do not know how to do a lot of things, which is bad, I would like to learn.

Researcher: But, you are kind of taking the opportunity to

Kate: Well, you know, we cannot do everything. Like if, if I learn about that, that time I could use for research or, so I have to take the opportunities like, if, we have these grants, LASCAC and all those grants. Those are good opportunity for me to have people to work on what I want.

Researcher: So, can we consider those grants as some kind of an incentive?

Kate: Yes.

Researcher: For you to use technology in your teaching.

Kate: Yes.

Collection: Teachers > Support > Financial

Episode Transcript: Randi

Clip Transcript:

the university has also been pretty supportive economically in terms of things. Scanners and things like that. Our new photocopier has a scanner or bookeye scanner, I will use those a lot. I have a handheld scanner that I will use for scanning text and things like that. But and then another part is what the people from the textbooks put in occasionally. There is a textbook that puts a useful technology my way but not nearly as often as you would think.

Collection: Teachers > Support > Financial

Episode Transcript: Sammy

Clip Transcript:

Researcher: Do you get any incentives for integrating technology in your classrooms?

Sammy: Incentives as far as from the department or just any?

Researcher: It could be like incentives in terms of release time or just stipend or appreciation?

Sammy: This is the first any kind of feedback that I have gotten that has been acknowledged.

Researcher: Do you think that kind of a system would encourage other teachers to integrate technology too?

Sammy: To have some kind of incentive or appreciation, of course.

Collection: Teachers > Support > Peer

Collection: Teachers > Support > Peer

Episode Transcript: Jade
Clip Transcript:
I think colleagues are the important resource. Like you can talk to your colleagues about learning new technology.
Collection: Teachers > Support > Peer
Episode Transcript: Sammy
Clip Transcript:
I do not know how to answer that question. We have Moodle, and then we have a separate webpage where we keep our attendance. Most of the assignments that I set up for lab, I do on my own. So, we do not really have a lot of resources for technology. And what we do have, of course we have access to it, but we do not. I share, we can add other teachers to our class, and we can join other teachers' classes, so we share. We can share lessons, they can take whatever they want from my page and transfer it to theirs. So we do some of that.
Collection: Teachers > Support > Peer
Episode Transcript: Sally
Clip Transcript:
so I am using some materials that I did not create. Some of what I am doing is, is that. Some pronunciation materials that were created by a group of us several years ago for that section of 180.
Collection: Teachers > Support > Peer
Episode Transcript: Sally
Clip Transcript:
I mean we help each other. I want to do something I do not know how to do, I will ask my colleagues and figure out somebody [?] but we do not have somebody who helps us with that.
Collection: Teachers > Support > Peer
Episode Transcript: Sally
Clip Transcript:
Researcher: And you also mentioned that you were consulting with your colleagues about
Sally: Hih hih,
Researcher: Can you elaborate on that a little bit like when you have a question do you just go talk to someone or how is that communication facilitated?
Sally: Yeah, we just go, walk into their office or e-mail if I cannot find them. I mean I know who else is teaching 180, for instance, And I know that they are dealing with the same problems. So, last week when I could not upload my files, I e-mailed [another teacher] and said hey what are you doing with your files. I said I have not tried it yet. What are you doing? And
Researcher: So you know what each of you are using and doing in your classes?
Sally: To a certain extent, yeah. Yeah.
Collection: Teachers > Support > Peer
Episode Transcript: Sally
Clip Transcript:

I hear somebody is using something. We, all of us, talk all the time what we are doing and I see oh that is a cool idea and so then I try it myself.

Collection: Teachers > Support > Technical and Pedagogical

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Susan

Clip Transcript:

we have students at the desk who can help with those sorts of technological issues in the classroom. And then [the LSRC director] who are available for the sort of soft side in terms of curricular development and how to implement different kinds of technologies into your classroom. So, I guess I would, I guess, as a user, sure I feel limitations because it is just my own lack of knowledge. But, I would not say that I have ever had, have not felt restricted. I have always, whatever it is I wanted to do somebody has found a way to make it happen.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Susan

Clip Transcript:

I find that I need some, for technology especially; I find that I tend to need somebody to show me how to do it as opposed to picking up a manual and following along in the manual. Probably because I just do not have the patience, you know, to sit trough and read. And, plus, I am a very visual person; it is good to have that right in front of [my] eyes.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Susan

Clip Transcript:

in terms of technology integration, we certainly have [the former LSRC director], well now, we have [current LSRC director], who is new and learning, filling the ropes (?), learning her way around. But we definitely always have a curriculum and technology specialist with whom we can make appointments as I have in the past said here is what I would like students to do, what do I need technology wise, you know, to help students achieve that.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Susan

Clip Transcript:

We will do like brown bag presentations and talks.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Ally

Clip Transcript:

It is very easy. I mean stuff with the Moodle, if I have questions about whether Moodle can do a certain or if I want to group students in a certain way or whatever, then, you know we have a department person who works with that. Yeah and so I guess, if I have questions about the software that is in the pronunciation lab, I could just talk to Elena or Jade. When we record, students do some formal presentations and they are recorded using the Pinnacle system in Pearson. Anyway, it is just a video recorder thing. And so,

then Jade and Elena would be the people to help me with that. So, yeah, it is very easy to find support.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Ally

Clip Transcript:

Well, there is things that I do not take advantage of [laughing] that are available. But every couple weeks, people in the Applied Linguistics program will present ideas on their research, which, a lot of times, integrates technology. So that would be a great place to go and a lot of times they would make pedagogical connections and so to go and get ideas. I do not usually do that because I have to watch my kids at home. But that is a good idea.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Randi

Clip Transcript:

Blackboard support I can get on the phone in instant, and it is always helpful and they can, Wimba a little harder, but that is, you know.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Randi

Clip Transcript:

But that is, yeah. I feel really lucky in terms of the tech support and the tech opportunities I have had here. Because otherwise I certainly would not be doing what I do, but, with technology, but yeah. There could be more.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Randi

Clip Transcript:

But I mean I cannot quit using Blackboard. So, that you know, for go ahead, they are gonna fix it because it is university wide. But if it were a technology that not the whole university was using or if they were gonna say Wimba, we might support it for you, but then we are gonna quit using it. Then if it is gonna be unsupported then I would not use it. They have integrated Wimba into the Supersite for my textbook. So, I feel confident that, you know, if I cannot use this for some reason at another, if I switched institutions. I can still go back and use the similar technology because somebody has found it valuable enough to, to do.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Randi

Clip Transcript:

So, I have not moved away from Blackboard, you know, higher tech people than I have heard, Moodle and all sorts of things like that but I feel like I need the technical support. If we ever go to all such an easy system that everybody can do it, I would go that way.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Sammy

Clip Transcript:

Well, there is other teachers. Recently, we have, we got an undergraduate who works in like computer, he is like our tech guy now. So he has got office hours here in the building. So, I have not taken advantage of this availability yet. But, resources we have. We have a couple of things. We have a vocabulary website that we are supposed to be using for our reading which is bottom of my list right now to get up and running. I do not know. I wish we had more.
Researcher: Were there times that you needed technical support and?
Sammy: Not very often.
Researcher: So, you find it easy to troubleshoot if you have any problems or?
Sammy: I hate to say yes, but [silence] I guess so. I like try to figure stuff out.
Researcher: So, I mean you have to, do you feel like you have to figure out on your own?
Sammy: I do not feel like I have to. But, I like trying to figure out on my own.

Collection: Teachers > Support > Technical and Pedagogical
Episode Transcript: Sally
Clip Transcript:
Well, we have our department tech guys if we have problems with our computers.
Researcher: Is that for like hardware stuff like?
Sally: Yeah, it would be like you try to print and it does not print

Collection: Teachers > Support > Technical and Pedagogical
Episode Transcript: Sally
Clip Transcript:
but as far as help, there is very, there really is not any support as far as using software.

Collection: Teachers > Support > Technical and Pedagogical
Episode Transcript: Sally
Clip Transcript:
But, as far as trouble shooting when you have a problem, you know, they do not have the staff to have somebody dedicated
Researcher: You mean the
Sally: 180 program. They do not have somebody, do not have a staff that they can say here is our tech person, they are gonna help you with whatever problems you have. I think most of us just figure it out on our own. And, [other teachers] had the same issue with uploading their videos. However, they both have Macs and so they ask [Moodle Admin], who is our Moodle person now and he suggested that they use iMovie which evidently uploads very quickly and it is easier than the converter that I have. But, I was able to convert mine fine with my IBM computer so, it is Dell it is not an IBM, but it is not a Mac. So.

Collection: Teachers > Support > Technical and Pedagogical
Episode Transcript: Kyle
Clip Transcript:
Pedagogically, the, we also get a lot of good suggestions from our staff here. How often I take them .... on certain things is a, is a good question.

Collection: Teachers > Support > Technical and Pedagogical

Episode Transcript: Kyle

Clip Transcript:

And this institution is very poor at recognizing that. Most of the staff outside of this department that I have experienced have an attitude that, that, it is the faculty's responsibility to spend the time to come to them to explain their issues, to ask for assistance, to, with the mechanics of this system. And this also happens in the, in the issues with the course management systems like blackboard. It is the faculty's responsibility to come to a training, to figure this out, to ask someone for help when of course, using blackboard in a 500 person lecture is extraordinary different than .... my course. But, is that a good use of my time when they are gonna be talking most of the time in a training session about a 500 lecture course, NO, probably not. But, no I also do not want to have to sit here for an hour with the trainer. There we go. I want to be able to get that stuff gone fast. And it is, sometimes it works fine around here, sometimes it does not. Our own staff are very very responsive but it is not their job to make our blackboard work right. It is the job of all the very very well paid people in, in Instructional Technology centralized places to do that. Some are OK, some are not so OK in doing that. So, and I, I do encounter often what I fear is an attitude that their time as staff is what they have to worry about and faculty have to accommodate to the staff's time. I am very much opposed to that opinion. The staff exist to assist faculty in the delivery of the goal around here which is good education and good research. And the staff do not have that attitude in many cases. They have an attitude of "I am here, but if you need help, you know, it is your job to find the time to come to me and get help. I do not like it. I do not like. My time is too valuable to do that, far too valuable. I get paid far too little compared to what is most of those kinds of people get paid. And, I will not allow them to waste my time.

Collection: Teachers > Support > Technical and Pedagogical > workshops

Collection: Teachers > Support > Technical and Pedagogical > workshops

Episode Transcript: Susan

Clip Transcript:

The CELT, I have gone to quite a lot of the CELT workshops.

Collection: Teachers > Support > Technical and Pedagogical > workshops

Episode Transcript: Jade

Clip Transcript:

English department usually have those workshops, like Moodle workshops. And also, not long ago, they had a workshop on the Lime Survey, which is an online survey system. I think it, they did a good job in getting teachers' needs ??? I think our member getting a survey about what kind of thing you want to learn about technology? So you can pick the stuff and they pick the most the voted thing to give a workshop about. So, this kind of support is really helpful

Collection: Teachers > Support > Technical and Pedagogical > workshops

Episode Transcript: Ally

Clip Transcript:

I get this, the e-mails from CELT about different ideas too, so that is nice. And I know that they have offered workshops before but I just, again, it is not something I have looked into.

Collection: Teachers > Support > Technical and Pedagogical > workshops

Episode Transcript: Sally

Clip Transcript:

With 180, you know, here is an example. I wanted to put my students' little video tape, you know, 180 program has, loans us the equipment, so I have a flip camera to use, to make a digital recording, but last week, I was going to put their, two years ago last time I taught 180, they had a, they purchased a program that converted files from the flip camera which are very large files into a file that could be uploaded to the Moodle and to a flv file. And so I was assuming that I could still use their program and they gave me a computer that did not have the program on it. And so I had to figure out some other way to do it. And I figured it out, they did not figure it out. So, you know, it is, I would say there is not much support. As far as, they did offer, they did offer two years ago little workshops on using the Moodle and things that we can do with the Moodle, that was quite helpful. But, as far as trouble shooting when you have a problem, you know, they do not have the staff to have somebody dedicated

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